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**December 1947**

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## **Growth and Development**

Reviews the literature for the three years ending July 1, 1947. Earlier literature was reviewed in Volume III, No. 2; Volume VI, No. 1; Volume IX, No. 1; Volume XI, No. 5; and Volume XIV, No. 5.

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## INTRODUCTION

THE RESEARCHES covered in this review reflect several trends in the studies of growth. Repeated tests and measurements of the same children continue to yield valuable information about what to expect in the course of development in the individual child. Norms for trends in growth are thus being set up, to supplement cross-sectional age-averages.

There is strong evidence for an increasingly felt need for more revealing tools with which to evaluate and predict. This is seen in an effort to tease out from the complex of factors, inherent and environmental, those which determine a particular child's slow or rapid progress (both physical and mental), his good or poor social adjustments, his pleasing or distorted personality, his physical vigor or inertia, his health, and his characteristic reactions to both detrimental and beneficial events.

On the environmental side the studies range from bio-chemical influences on the fetus, on the one hand, to social classes and cultural practices on the other. In the studies of inner drives and the evaluation of environmental impacts on them, there is an increasing use of projective technics, primarily the Rorschach, the Thematic Apperception Test, and various forms of doll play. Altho much has been published on these tests, they remain relatively crude and unstandardized, and they still depend largely on the guesses and clinical insights of the persons who use them.

As for the ages of the subjects studied, there is an extension of interest to the developmental changes which occur thruout the entire life span. The studies of emotional factors affecting development in early infancy are very provocative, but so far they may be classed as primarily exploratory, and needing more exact experimental control. Altho the developmental processes in the adult are slow, there are continuing changes in mental functionings, outlooks, attitudes, and physical conditions of the individual as he grows older. An understanding of these changes is important, not only for the general study of human development, but also for the evaluation of adult-child relationships, which are a part of the social environment in which the child is growing and to which he is reacting.

There is an increasing and very significant interest in interdisciplinary relationships. The extent to which the various growth processes and environmental factors are interrelated and influence each other has been the subject of a number of studies. It has been difficult to decide how to classify such researches. Altho the same research may be mentioned in more than one chapter, the general policy has been arbitrarily to restrict mention of a study to one chapter. Therefore, readers, looking for studies which extend across several areas, should consult all of the chapters which may be concerned.

NANCY BAYLEY, *Chairman*  
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## CHAPTER I

### Intellectual Growth in Childhood

FLORENCE L. GOODENOUGH and DALE B. HARRIS

#### Introduction

THE three years which have elapsed since the publication of the previous review of this topic by Worcester (69) have been characterized by continuation of previous lines of interest rather than by extensive embarkation into unexplored channels. Perhaps the most noticeable shift in emphasis is to be seen in the increasing use of projective methods and particularly of drawing and painting as a means of exploring the more subtle aspects of the child's inner world of thoughts and feelings and the changes in his mental structure that come with growth and experience. Altho it is primarily concerned with the use of drawing and painting in the clinical study of children, the two-volume report by Alschuler and Hattwick (2) includes many significant observations on the mental changes that occur during the preschool years, while the somewhat more impressionistic work of Werner Wolff (68) provides further suggestions as to the possibilities of this line of approach to the study of the less readily accessible areas of the child's mind.

The triennium has also been marked by a renewal<sup>ed</sup> of interest in the nature-nurture controversy, chiefly on the part of the environmentalists, and by a number of important studies on the predictive value of tests over considerable periods of time. Other topics on which considerable research activity has been expended include the field of racial and sex differences, educational retardation, particularly in respect to reading, the growth of conceptual thinking, and the mental growth of children suffering from various physical handicaps, including cerebral palsy. Several important new tests have been brought out and the reliability and validity of some of the earlier tests have been subjected to renewed scrutiny.

#### General Texts and Reviews

The *Manual of Child Psychology* prepared under the editorship of Leonard Carmichael (9) is by far the most comprehensive review of all the major research findings in the field of child development that has appeared since the publication of the two earlier editions (*Handbook of Child Psychology*, First Edition, 1931, Second Edition, 1933) edited by Carl Murchison. The nineteen chapters, each by a specialist in the field covered, are well documented with bibliographies running up to several hundred titles on a single topic. This makes the book an invaluable reference source for all who are working in the field. Chapter 9 entitled, "The Measurement of Mental Growth in Childhood," by Florence L. Goodenough and Chapter 11 "Environmental Influences on Mental De-

velopment" by Harold E. Jones are most closely related to the present discussion but most of the others include some material pertinent to this field.

Gertrude Hildreth (25) has published a supplement to her *Bibliography of Mental Tests and Rating Scales*, which covers the material published since the date of the original list (1939) thru 1945. Thurstone (54), in a brief but cogent discussion of the different theories of the nature of intelligence and their relationship to the methods of deriving scales for appraising the mental level of children, has given some account of the derivation of his recently published scale of primary abilities for ages five and six.

### New Tests

Among the new tests for use with young children, this extension of their work on the measurement of primary mental abilities by Thelma G. and L. L. Thurstone (55) should be given first rank. Five primary abilities—verbal meaning, perceptual speed, quantitative, motor, and space—have been isolated. Mental age norms for each of these abilities separately and for the total are available, from which quotients may be obtained by the usual method. All the tests are pictorial and no knowledge of reading or writing is required. No data on self-correlation of the various scales or on the stability of the results over a period of time have been presented as yet. Valentine (58) has devised a new intelligence test of the year-scale type for use with children between the ages of eighteen months and eleven years. Some of the items are taken from the work of Gesell, Terman, and others while the remainder are original with the author. This test was tried out by Wakelam (59) with 251 kindergarten and primary grade children in the Birmingham schools. The correlation with teachers' judgments of ability was found to be  $+ .60$ ; with measurements of later educational achievement the correlation was  $+ .81$ . For a group of forty children who were very backward in reading, the extent of improvement under remedial instruction was predicted by the test to an extent indicated by an  $r$  of  $+ .49$ . The stencil design test recently developed by Grace Arthur (5), while intended primarily for use with older children, is also adapted to the upper ranges of the preadolescent age group. The test is a highly original one and is said to provide a particularly valuable situation for the clinical observation of children in addition to the quantitative scores. The preschool form of Wilson's Symbols Scale seems to have promise as a reading readiness test (66). Drummond and Gilliland (15) have given a brief report on the methods they are using for the validation of the Gilliland-Shotwell Infant Intelligence Scale, which is still in process of development.

### Mental Development in Infancy

*The Embryology of Behavior* by Gesell and Amatruda (17) is an exceptionally thought-provoking account of the fetal and neonatal behavior

of the human infant presented against a background of racial history on the one hand and the hope of individual and racial progress on the other. Two articles by Morgan and Morgan (42), (43) suggest that the rate of acquisition of certain adaptive behaviors such as following a moving object with the eyes, response to playful approach by the examiner, etc., not only provide valuable information as to the developmental level of an infant at the time but may also be predictive of his future potentialities. Irwin and Chen (30) correlated the speech sounds of ninety-one infants under the age of two years, classified on the basis of type (number of different sounds) and token (total number of sounds made during a specified time) with their mental ages on the Kuhlmann-Binet Scale. None of the obtained correlations was high enough to be reliable. This suggests that the development of speech sounds during the first two years of life is relatively independent of mental test performance.

### Mental Tests and Prediction

Of particular significance is Bradway's recent study (6) based on a follow-up of 138 of the 213 children between the ages of two and five-and-a-half years who were tested in the course of the original standardization of the 1937 Revision of the Stanford-Binet Scale and retested with Form L of the scale ten years after the original testing. Every attempt was made to locate and retest as many of the original group as possible and the analysis of the results is very complete. On the basis of manifest content, the scale items were divided into four sub-scales: (a) verbal, (b) nonverbal, (c) memory, (d) number. Both the separate items and the differential scales for verbal and memory abilities at the preschool level predicted later standing better than did the other two scales. For the total scale the correlation between initial Form L and final Form L was  $+.58$ ; between initial Form M and final Form L,  $+.67$ , and between initial composite (L + M) and final Form L it was  $+.66$ . Little correlation was found between the usefulness of an item in predicting total score at the time of testing and its value for long time prediction—a fact which casts considerable doubt on the validity of this highly popular method of item-analysis.

Hirt (26) reported retest findings on the 1916 Revision of the Stanford-Binet for 1357 children, with a wide range of ages and intervals between testings, who had been referred to a child guidance clinic. Forty-six percent changed less than five IQ points; three and a half percent changed twenty points or more. Allen (1) compared the standing of 327 fourth-grade children on the Kuhlmann-Anderson Group Intelligence Test with their performance on the same test when they were in the first grade. She found that results expressed in terms of IQ were somewhat more stable ( $r = +.69$ ) than when they were stated in terms of the *Percent of Average* recommended by the authors of the test ( $r = +.65$ ).



### Factors Associated with IQ Changes in Childhood

In four studies from the University of Iowa Child Welfare Research Station the earlier statements of that group with respect to the effect of nursery-school training and foster home placement upon the IQ's of children are reasserted. Wellman (61) analyzed the results of some fifty studies reported in the literature and found a general tendency for IQ's to increase after a period of attendance at nursery school which was slightly greater than that found for non-nursery school children. In an attempt to account for the alleged effect of nursery-school attendance, an analysis of teacher-child contacts was made by Wellman and McCandless (62) using a time-sampling technic with carefully defined categories. A first study based upon sixty-six cases showed no relationship for the group as a whole between the number or type of teacher-child contacts and either changes in IQ or in vocabulary as measured by the Smith-Williams Scale, but an  $r$  of  $+0.475$  was obtained between teacher-contacts and change in vocabulary for eighteen children who were new to preschool. Similar results were obtained in a second study of thirty-four cases in which the vocabulary score was considered in relation to mental age. Again the relationship between teacher-child contacts and vocabulary change was positive only for the new entrants. A study by Wellman and Pegram (63), in which the original data from the orphanage study reported in 1938 by Skeels, Updegraff, Wellman, and Williams were reanalyzed by somewhat different methods from those originally employed, has been criticized by McNemar (38) on technical grounds. It might also be noted that from the facts here presented for the first time it can be determined that the distribution of ages at initial and final testing was very different for the preschool and the nonpreschool groups. It appears that equalization of the age factor would cause most of the reported differences between the groups to disappear. Skodak and Skeels (51) made a very complete analysis of the results of a further testing at the average age of seven years, 0.7 months of 139 of the adopted children in the group which they have been following. The mean IQ at this time was 113.1. The correlation between the IQ's of the children (all of whom were placed in their adoptive homes before the age of six months) and the education of their true mothers continued to exceed that between child IQ and foster-mother education but, as the authors correctly point out, this does not explain the high mental level of these children.

McHugh (36) reported a mean IQ increase of 7.4 points on the Good-enough Draw-a-Man Test for eighty-three children after two months attendance at kindergarten. The precaution of delaying the administration of the test until after at least a month of kindergarten attendance recommended by the author on page fifty-six of the manual of instructions was evidently not followed. Tomlinson (57) found that when the older member of seventy-five pairs of Negro siblings in the age range of four to nine years was compared to the younger member with respect



to IQ on the 1937 Stanford-Binet, a significant difference in favor of the younger siblings was established. Further research is needed to determine whether this difference is innate, environmental, or due to the nature of testing instrument.

Two studies on factors related to large changes in IQ yielded very different conclusions. The first is a statistical investigation by Bradway (7) of the fifty cases with largest IQ changes taken from the study mentioned in an earlier paragraph (6). The data are entirely quantitative and a large number of possible causes both in the hereditary background and in the cultural and emotional conditions under which the children were reared were investigated. Altho most of the factors studied showed some relationship to IQ change, factors such as parental IQ, grandfathers' occupational status, and others which Bradway regarded as determined chiefly by "inheritance" showed a far higher correlation to IQ change than did such "environmental" factors as the Minnesota Home Index, happiness in the home, material surroundings, and the like. In a much more impressionistic type of study, Despert and Pierce (14) found that of twenty-two nursery-school children whose IQ's changed ten points or more on retests, the direction of change appeared to be related to concomitant changes in the children's emotional adjustments. Harris and Thompson (20), however, have pointed out that such changes as occurred can be explained on purely statistical grounds.

Cooley (11) found little difference between dull and bright children with respect to their amenability to child guidance. Yager (71) found that under experimentally induced emotional tension, intelligence test scores were more likely to increase than to decrease.

### Critical Studies of Tests and Testing Procedures

Studies of the reliability of the Goodenough Draw-a-Man Test have been made by McCarthy (34) and by McHugh (36). The latter has also reported biserial correlations between items on the Draw-a-Man Test and 1937 Binet IQ's (37). Ames (3) reported that the presentation of an incomplete model on which children were to supply the missing features facilitated drawing in the case of young children but interfered with it after the age of approximately five years. Patterson (45) found that mentally defective boys under the age of ten years gained more from practice on the Arthur Performance Scale than those over ten. Wallin (60) compared the correlations of the 1916 and the 1937 Revisions of the Stanford-Binet with those from the Arthur Scale and found that the 1937 revision usually yielded lower IQ's than the Arthur Scale and that the correlation between the two was only  $+ .53$  as compared to  $+ .72$  for the 1916 Revision. It should be noted, however, that different subjects were used in the two comparisons. Hutt (29) failed to secure any evidence that a modified order of presentation of test items, planned to be more "acceptable" to the subjects, yielded higher results than those obtained

by the standard order. Tilton (56) found that backward children "scatter" more than average or bright ones on various standard tests. Mayman (41) published a review of sixty-one studies on this topic, the greater number of which were based on the Stanford-Binet. Spaulding (52) found little consistent tendency towards change in IQ when complete Stanford-Binet test blanks were rescored on the basis of the abbreviated scale. Wright and Magaret (70) found higher first factor loadings for those items of the 1937 Stanford-Binet that are more difficult for mentally defective children than for normal subjects of corresponding mental age. Criticism of the Kuhlmann-Anderson group tests by Wimberly (67) seems to have been adequately disposed of in a reply by Anderson (4) who admitted, however, to some lack of clarity in the original account of the method of standardizing the test. In an important monograph, Maurer (40) has shown that when intellectual status at maturity is used as a criterion for item validity, the choice of items for use in scales intended for children of preschool age is likely to differ considerably from that made on the basis of immediate indications at the time of testing. This is quite in accordance with the report by Bradway (6) previously mentioned. Kent (32) has established tentative additional norms for the younger ages on her Emergency Battery, and Sanderson (48) has provided figures for the fifth, eighth, and eleventh school grades on the Porteus Qualitative Maze Test.

### Racial and Sex Differences

Perhaps the most intensive and extensive study of sex differences in mental traits that has ever been made has recently been completed in Sweden by Siegvall (50). Only the brief mention of this study in the *Psychological Abstracts* has been available to the present writers but the importance of the study seems to justify its mention. Lewis (33) discovered an excess of girls over boys in the upper two percent of the distribution in a study of the results on the Kuhlmann-Anderson Test from approximately 45,000 subjects in grades four to eight from thirty-six states. This is contrary to the usual findings and may be due to the large verbal content of the test used. Chapanis and Williams (10) reported a similar excess of girls in the upper brackets on this test for both white and Negro children in Tennessee. Negroes of both sexes fell below the performance of the whites. Brown (8) ascribed the low standing on the Stanford-Binet of Negro kindergarten children in Minneapolis to environmental constriction. Both Darcy (12) and Demarest (13) found bilingual children inferior to monolinguals on the Stanford-Binet. Havighurst and his associates (21), (22) gave a number of performance tests to children in several Western Indian tribes. The results varied considerably from one tribe to another. The Hopi group had an average IQ of 110 while the Papagos were below the average for the whites. There was no evidence that amount of white blood was a factor in test performance. On the

Draw-a-Man Test the Indians generally surpassed the standards for white children.

### **Physical Handicaps in Relation to Mental Development**

Children handicapped by cerebral birth palsy have been subjects of a number of investigations during the triennium. The difficulties encountered in arriving at a dependable appraisal of the intelligence of these cases has been pointed out by Strother (53) and by Maurer (39). The latter has described a modified form of the Stanford-Binet for use with spastic children. She obtained an average IQ of seventy-nine for eighty-five diagnosed cases and a test-retest correlation of  $+.90$ . Sarason and Sarason (49) attempted to use the difference between performance on the Kohs Block Design Test and that on the Stanford-Binet as a means of discriminating between mentally defective children with and without cerebral birth palsy. A Kohs performance scoring eighteen mental months or more below the mental age attained on the Binet appeared fairly diagnostic of brain damage while the reverse tendency seemed characteristic of children whose defect was of the familiar type. Werner (64) found evidence that nonbrain-injured mentally defective children show a kind of "global" or undifferentiated perseverational tendency in the test situation while those suffering from brain injury display a less generalized, unpredictable form which Werner designates as "disintegrated."

### **The Development of Logical Thinking in Childhood**

McHugh (35) found no basis for Moore's contention that autistic thinking, defined as the tendency to draw conclusions on the basis of a false premise, is a special and transitory phenomenon of childhood. Its course of development is merely the converse of that of logical thinking and is a function of the difficulty of the task rather than of age as such. In like manner, Huang, Yang, and Yao (28) found that "phenomenistic" explanations by children are dependent upon the apparent similarity between antecedents and consequent when the true nature of the causal relationship is unknown. Huang and Lee (27) found that young children were more strict in granting the status of *having life* than of *living* to a variety of animate and inanimate objects. Language differences make desirable the repetition of such a study in this country. Werner (65) is of the opinion that much of the discrepancy in the reports of various investigators of the nature and significance of "mental rigidity" can be traced to differences in their definitions of the term. Piret (46) found that much valuable information can be had by asking children to give their reasons for replying as they did to those items on intelligence tests which require the drawing of conclusions or other acts of logical judgment. Mott (44) reported that by having children go thru a series of specified movements of different parts of their bodies, together with verbal descriptions of these movements ("This is my head. I nod it"), the number of parts shown in

their drawings of the human figure will be increased. She concluded that concept formation is facilitated by muscular action.

### Mental Development in Relation to Learning

Gill and Gill (18) found correlations in the neighborhood of  $+ .85$  for various elementary-school classes between scores on the Kuhlmann-Anderson Tests and Gates Silent Reading Tests. In a carefully conducted study by Jackson and Phillips (31) the IQ was found to be more symmetrically distributed and hence was judged to be a better indicator of first-grade reading success than the MA. Herr (23) reported a beneficial effect of prefirst-grade training upon both reading readiness scores and those earned on the Pintner-Cunningham Primary Intelligence Test for five-year-old Spanish-American children. Factors associated with reading difficulty have been studied and discussed by Hildreth (24) and by Robinson (47) while methods of overcoming reading handicaps have been outlined by Farson (16) and by Gillingham and Stillman (19).

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## CHAPTER II

### Mental Development during the Preadolescent and Adolescent Periods

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**M**OST of the recent studies of mental development in later childhood may be characterized as exploratory, with indications that more extensive and analytical research may be expected. Some specific factors investigated are at times difficult to relate to the general pattern of development. As significant as many of these specific factors are, their importance to the growing child is often confused by complexities within the child himself and within the technics by means of which he is studied.

#### Methodology

One difficulty in tracing mental development is the changing nature of the individual being studied, making inappropriate the materials and technics used at an earlier age. Gesell, *et al.* (18) found it necessary to modify their procedures from age to age to meet the shifting contexts and accents of development. Their developmental reference points are not "norms" in the sense of successive steps on a scale, but as stages thru which development progresses. These stages, called "growth gradients," they warn, will be of aid to child guidance only if they are used in relation to the total growth "complex."

A similar methodological approach to the study of development has been proposed by Olson. By following growth in a number of characteristics, Olson and Hughes (39) state, a better understanding of development is secured than by studying a single attribute. Various attributes tend to cluster around a "center of gravity of growth" of that individual. Jones (26), using longitudinal data on children ten to eighteen years, traces the development of one boy as compared with the norms set up for the group. The pattern of the boy's progress is traced for intellectual, physical, and various social and personality factors.

#### Technics

The development of technics during the period covered by this report has been characterized more by their breadth of content than by the precision and control of nonexperimental variables. Considerable attention has been given to projective technics, and the aspects of behavior with which the results may be associated. In these studies there seems to be less statistical validation of methods and results than is ordinarily expected in research reports. Whether this will be an advantage or a disadvantage future progress will have to decide.

Schmidl (47), reviewing the literature on the use of the Rorschach test

in relation to delinquency, points out that students of this technic have not arrived at any definite criteria for detecting delinquents. It may be necessary, he concludes, to quantify some of the factors of this technic which up to now have been considered qualitative.

The Thematic Apperception Test has been applied in a variety of studies. In studying the case of an adolescent problem boy Rosenzweig and Isham (43) compared Thematic Apperception Test results of the boy with that for his mother. The authors point out the value of the technic in demonstrating complementary psychodynamics of such problems.

Until recently the Porteus Maze Test has been used chiefly as a measure of the kind of intelligence correlating with the Binet scales. Porteus (40), however, has proposed a "qualitative score" derived from the way in which the mazes are marked. These qualitative scores were used by Sanderson (45) with children in Grades V to XI. She found a definite relationship of these scores to age and grade in school altho the correlation with the quantitative maze scores and Binet scores was reported to be low. A greater difference was found between those in Grades V and VIII than between those in Grades VIII and XI.

The relative influence of group testing and individual testing technics was studied by Bennett (2). The Terman Group Test of Mental Ability was administered individually to one group, and was given to a matched sample as a group test. She found no evidence that "social facilitation" or its opposite influenced the scores. Goldfarb (19) compared two standard intelligence tests, the Stanford-Binet form L, and the Wechsler-Bellevue, on a group of adolescents. They scored higher on the Stanford-Binet. Sartain (46) also found that college students score higher on the New Revised Stanford-Binet than on either the Bellevue or the Otis Self-Administering test. Roth, *et al.* (44) describe a testing program in which 95.5 percent of the child population in a county were tested or appraised for their intelligence.

### **Longitudinal Studies and Relationships with Later Development**

Pointing out that little research was found on the constancy of the IQ during adolescence Knezevich (29) studied changes in Henmon-Nelson scores from the high-school sophomore to the senior years. He found considerable shift in position within the group ( $r = .70$ ) with a mean increase of two IQ points. It appeared that mental growth of this group slowed down but did not stop at sixteen years. It should be pointed out that this study did not include a comparison of changes in intelligence test scores for students in different environments as has been characteristic of similar studies at the younger ages.

Gesell, *et al.* (18) have reported research findings on children to ten years of age. This report is a longitudinal study in a biographical or clinical sense, but does not propose to be confirmed to seriatim data taken at regular intervals with the same measures. Ten years after a group of

preschool children had been examined with the Revised Stanford-Binet scale the same children were reexamined by Bradway (5, 6). As noted in Chapter I, several factors in the environments of those who had shown the most significant changes were studied. Muench (37) located and retested a group of boys living in the city of (Columbus, Ohio) who had been diagnosed as mental defectives in the Opportunity School eighteen years previously. On the Stanford-Binet, Porteus Maze, and Army Alpha he found a statistically significant increase. On a literacy test the increase was not significant, and on the reading test there was little or no change.

A few studies have been reported in which adolescent behavior was related to adjustment in the Armed Forces. Gardner and Goldman (17) compared the childhood and adolescent histories of five hundred sailors confined to disciplinary barracks with that for sailors who had not been subjected to disciplinary action in the Navy. Eight factors were isolated as being predictive: (a) broken home, (b) truancy, (c) expelled from school, (d) retarded three or more years in school, (e) persistent enuresis, (f) running away from home, (g) civilian arrests, and (h) atypical sexuality.

Lagrone (32) found that patterns of delinquent behavior tended to appear at an early age among recidivists in military service. He found, however, that a broken home did not distinguish between recidivists and nonrecidivists. This is not necessarily in disagreement with the results of Gardner and Goldman since they compared disciplinary cases with non-disciplinary cases.

Marmor and Zander (35) found that a significantly large proportion of Maritime Service enlistees were immature, low in ability, and were from poor or unhappy homes. Those sixteen-year-olds were consistently poorer in scholastic success and home conditions than seventeen-year-olds. The influences of Selective Service policies on these factors were pointed out.

### Language

A study of the language of adolescents was included as part of the California Adolescent Growth Study. Changes in speech were measured over a four-year period by means of records of spontaneous verbalizations in a "free" social situation. Jones (27) reported that adolescent language was typically colorful, centered largely in personal and interpersonal relationships. Over the four year period it became slightly more careful, less colorful, and was centered in world affairs and in interests of an academic or vocational sort.

A study of the kind of language used by school children in Grades IV to XII was made by Chotlos (12) who secured 3000 written language samples from 108 school children selected at random from a large population. Older children and those with higher IQ used more highly differentiated language structure, more nouns and adjectives. Younger children and those with lower IQ used more verbs. Carlton and Carlton (9) found

that mentally defective adolescents made more errors and different kinds of errors in oral language than did a "normal" group of the same mental age, sex, and parental socio-economic status. Reiss (42) studied the kind of words (homophone, antonym, synonym) to which children of different ages could most easily be conditioned.

One of the difficulties in studying language development in relation to other measures of mental growth has been the lack of crucial, comprehensive language measures. Johnson (24) has proposed quantitative measures of language behavior which appear to meet some of these requirements and permit more adequate statistical analysis.

### **Mental Development in Relation to Cultural and Racial Characteristics**

Several studies have been reported in which mental development has been related to rather broad cultural patterns. Most of those related to personality and social behavior have been summarized in chapters IV and V.

A study of the impact of the English culture on orientals living in Hawaii was made by Kuhlen (30). The Pressey Interest-Attitude Test was given to 1589 Japanese and 690 Chinese, the results of which were compared with those for white children of comparable age and grade. He concluded that cultural influences on taboos and moral wrongs (which are sufficiently crystallized to be taught as such) were made rather early. Chinese who had been in Hawaii longer were more similar to the white children.

Demarest (14) studied the differences on five standard tests administered to Anglo-American and Spanish-American Grade VII boys. There were marked differences in results on the Stanford-Binet and the vocabulary test. The Wechsler-Bellevue test gave the most comparable results for the two groups.

The effects on the child's development of changes in cultural influences were studied by Ojemann (38). Units were incorporated in Grade IX science classes which were designed to develop an analytical approach to human behavior. An hypothesis underlying the program was that one important factor in determining the growth of a person's behavior toward another is the insight he has into the factors which underlie and determine human behavior. The results of tests show that the ideas presented were not too abstract or beyond the pupils' learning ability.

Pratt (41), studying the fears of rural children four years to approximately sixteen years of age, concluded that girls have more fears than boys. The evidence indicated that the number of fears increased with age. Some fears appeared to have a cultural rather than an individual and specific origin. On the other hand, Kuhlen and Arnold (31) comparing twelve year old children with those eighteen years old found no evidence that "problems" of a religious nature increased with age. Significant differences in religious beliefs were found, however, between the two age groups.

### **Social Adjustment in Relation to Mental Development**

Studies of several technics have been reported for identifying delinquent children and for predicting their adjustment. Bijou and McCandless (4) studied predelinquent, mentally retarded boys (mean Binet IQ of 69). They found that children with certain patterns on psychometric tests made better institutional and post-institutional adjustment than those with different patterns of test performance. Those with highest "behavior efficiency" (disparity between score on performance test and score on verbal test) had made better adjustment six and one-half years after leaving the institution (3).

Using the Woodworth-Mathews Psychoneurotic Inventory, Harris (22) found that this questionnaire did not predict much better than chance the stability, or "emotional adjustment," of delinquent boys in a correctional school. A means of scoring the Porteus Maze Test has been proposed by Porteus (40) which in his study clearly distinguished delinquents from nondelinquents. Ash (1) found that there was a marked discrepancy between scholastic ability of delinquent adolescent boys and their actual school achievement.

Studying the electro-encephalogram (EEG) of children with behavior problems, Michaels and Secunda (36) found that those in the thirteen- to eighteen-year age group exhibited a higher incidence of EEG abnormality than children in a younger age group. Neurotic traits, with the exception of a history of enuresis, did not appear to be associated with EEG abnormality.

Some relationships of intelligence to delinquent behavior were studied by Stadford (49). Socio-economic and cultural factors appeared more important than intelligence in determining the type of problems presented by Negro children at the Institute of Juvenile Research.

The question of fluctuations in adolescent friendships was studied by Thompson and Horrocks (23, 51). The results of these studies do not confirm the theory that adolescents' behavior is extremely erratic and unstable, since adolescents demonstrated the same degree of stability in their friendships as did the preadolescents.

### **Personality Adjustment in Relation to Mental Development**

Research published on personality adjustment has been varied both in content and method of investigation. Some studies not included in Chapter V are mentioned here. Scores on the Minnesota Multiphasic Personality Inventory were found by Capwell (8) to distinguish between delinquent girls twelve to eighteen years old and a comparable group of nondelinquent girls. In another study she reported that changes in IQ do not seem to be associated with personality adjustment (7). The Rorschach technic was used by Goldfarb (20) to study the influence of early environment on the character and extent of mental development. Adolescents in foster homes who had spent three years in institutions very early in life showed



more undesirable personality traits than did a comparable group (age and sex) who entered similar homes without such institutional experience.

Gruen (21) found that "adjusted children" twelve to fourteen years of age as measured by the Rogers Test of Personality Adjustment kept estimates of their ability slightly above their performance level. "Mal-adjusted" children kept their estimates below their performance level or made gross over-estimates. Worbois (53) found that children who had participated in an intensive guidance program exhibited better emotional adjustment as measured by the Luria technic than did a group of control children.

Investigating the question of whether adolescent and postadolescent children have more unpleasant experiences and fewer pleasant experiences, Thompson and Kepler (52) asked students in the Grades VI, IX, and XII to list as many of both kinds of experiences as possible. Preadolescents gave more pleasant items and fewer unpleasant items than did adolescents and postadolescents. The authors point out that the adolescent's life expands to include sex, social, vocational, and other interests some problems of which may be difficult to resolve.

### Learning

One correlate of learning ability commonly used is school achievement. The relative achievement of dull and bright children was compared with their expected achievement as predicted from their mental age by Lewis (33). He found that bright children were retarded and that dull children were advanced in comparison with expectation. As was pointed out, however, chronological age should be held constant since the dull children have spent more time in school.

Conditioning of four different age groups (seven years to eighteen years, six months of age) to give an electro-dermal response to various kinds of words was studied by Reiss (42). Of the three types (homophone, antonym, and synonym) the youngest group showed the greatest transfer to homophones and least to synonyms. The results were the reverse for older children. Shaw and Kline (48) found that "muscle action-potentials" increased with the difficulty of the problem and was higher for those of lower intelligence. Klugman (28) used as a memory problem the copying of a dot from one sheet to another in the same location on the page.

### Sex Differences

Sex differences in mental measures are not uncommon for children during the adolescent period. The significance of these differences are often obscure, however. Standard intelligence tests deliberately minimize the differences by including items which do not contain sex discrimination. When sex differences are found on such tests there is a question whether to interpret the results as differential rates of development or as factors which were not controlled in the construction of the test.

Lewis (34) compared the proportion of boys and girls in the upper ten percent of 45,000 children in Grades IV to VIII from thirty-six states. Since 2676 girls and 1853 boys were included, he states that there is no longer any justification for stating that more superior boys and girls are to be expected. Chapanis and Williams (11) found that girls in a Tennessee county were superior to boys on the Kuhlmann-Anderson test scores. Terman, *et al.* (50) discuss and evaluate the research on "Psychological Sex Differences."

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References to this subject for the three years prior to June 1944 are reviewed in this Growth and Development series by Froelich (16). The recent number on "Psychological Tests and Their Uses" of this REVIEW, prepared under the chairmanship of Herbert S. Conrad (13) is a valuable source of references on the instruments for testing and evaluating mental development. The *Manual of Child Psychology*, edited by Carmichael (10), especially the chapters, "The Adolescent," by Dennis (15), and "Environmental Influences on Mental Development," by H. E. Jones (25) include many pertinent references predating the period covered in this review.

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## CHAPTER III

### Intellectual Changes during Maturity and Old Age

IRVING LORGE

As suggested in the last review of this topic in 1944, a large proportion of the published articles on intellectual changes during maturity and old age refer to the use of tests of intelligence, memory, and other functions in psychosis. For the current review, therefore, articles involving intellectual changes in clinical cases are not cited unless they also make a contribution to the understanding of normal aging processes. In general, the trend during the last three years has been toward the development of so-called short form, emergency, or rapid methods of appraising intelligence. While such rapid methods may have value in the speedy classification of personnel, the resulting tests tend necessarily to become less reliable, less valid, and less global. A consequence of the rapid testing, therefore, is a restriction in the amount of material available for a description, if not an explanation, of the intellectual changes in the aging process.

The Wechsler-Bellevue test continues to be the most widely used intelligence scale for adults despite occasional criticisms of its standardization or of its measurement of deterioration. The criticism of the naive interpretation of *intelligence test scores* is being continued with a few studies pointing up the influence of experiences, training, schooling, and remedial reading on such scores.

#### Reviews of the Literature

Brody (7) has brought up-to-date his review of the literature on the use of tests for the study of psychoses and allied disorders. His summary considers the relation of premorbid intelligence to intelligence in mental illness, the measurement of so-called deterioration, the diagnosis of psychopathology thru test results, and the relationship of therapy to changes in test scores. Another excellent treatment of the same topic was made by Jones and Kaplan in the essay "Psychological Aspect of Mental Disorders in Later Life," in the book by Kaplan (24). An intensive critical appraisal of the studies on the quantitative and qualitative sequelae of organic brain lesions and ablations was made by Klebanoff (27) who gives a bibliography of 138 references. A fairly complete résumé of the results from the use of the Wechsler-Bellevue was made by Rabin (45). This summary was supplemented and somewhat amplified by Watson (56).

The Subcommittee of Social Adjustment in Old Age has prepared a research planning report (49) which includes a classified and annotated bibliography of 429 titles. Lorge (49: 125-32) reviews theories and pre-

vious research about intelligence in old age, and suggests needed research in the area. Among the theoretical research suggestions is the notion of constructing an adult intelligence test based on the experiences of adults, and the clarification of the concept of mental deterioration. Rosenthal (49) has appended a bibliography in twelve sections.

Robert Ellis (11) surveyed the literature on relative variability of mental traits. One section of the survey deals with age differences suggesting a confusion due to inadequacy of measurement and the mixture of speed and power in appraisal of some mental functions.

### Test of Adult Intelligence

The third revision of Wechsler's book (57) is basically like the earlier editions. New material is added about test patterns in clinical evaluation and for estimating mental deterioration. Some criticism about tests that "hold up with age" was made by Rabin (42). He gave the Wechsler-Bellevue to 100 hospital patients including psychotics. The results suggest that separation of tests as those which *do* or *do not* hold up with age is not substantiated. In another study (44) of 60 patients on test-retest with the Wechsler-Bellevue, the retest correlations for separate subtests ranged from .44 to .99, the lowest was for comprehension and the highest for information. In general, over an average period of about thirteen months, significant gains are made in arithmetic, block designs and digit-symbol.

The Shipley-Hartford Retreat Scale is currently used as a quick measure of intelligence and of mental deterioration. For deterioration, the conceptual quotient is used. The CQ represents the ratio of ability on abstractions and so-called basic ability in terms of vocabulary. Wright (59) shows the correlation between Wechsler-Bellevue and total Shipley as .77 and between the Verbal Scale of the Bellevue and the vocabulary of Shipley as .64. The deterioration, however, is greater on the abstraction test. Lewinski (31) shows correlations between Bellevue IQ's and Shipley vocabulary of .58, and Shipley abstraction of .61. Bradford (6) criticized the norming of the vocabulary section for British use. He rescaled the test and reduced the items to twenty. The new list correlates .95 with Shipley's original forty. Using the Shipley-Hartford with military prisoners, it was found (34) that more than half of the disciplinary cases had CQ's indicative of impairment. Assuming the vocabulary to be poorly standardized, the Army General Classification Test was substituted for the vocabulary. The result was that the CQ's now corresponded to the original norms. Garfield (16) points out that the mental age via Shipley-Hartford is lower than that via the total Wechsler-Bellevue.

Berdie (4) indicated that the Goodenough Draw-a-Man Test would be a valid indicator of adult intelligence at the lower levels of ability. Verville and Cameron (53) show identifiable age differences in perception of incomplete pictures suggesting that the ability to break *set* may be a factor.

### Short Forms of Intelligence Test

On the basis of intercorrelations of Wechsler-Bellevue subtests with total scale, several short forms have been proposed. Geil (17) suggests Comprehension, Similarities, Digits, and Block Design which correlates .97 with full scale; Springer (50) shows a correlation of .96 for Comprehension Arithmetic and Absurdities; Arithmetic and Comprehension (10) correlated .93 with total verbal; Gurvitz (21) shows a correlation of .90 with Digit Span plus Picture Arrangement; and Patterson (38) reports five different short forms.

The Kent Emergency Test (E-G-Y) correlated .74 with the Wechsler Mental Ability Scale (21). Lewinski (30) reports a shortened form of the Kent Oral Emergency Test which correlates .81 with the longer form. Rautman (47) indicates that the Kent test gives IQ's ten points higher than the Revised Stanford-Binet, even tho the two tests correlate .84. The Kent test has been demonstrated to be invaluable as a quick appraisal. Additional norms are provided by the author (26).

Lewinski (29) found a correlation of .64 between the Bellevue-Wechsler and Scale B of the Herring Revision of the Binet and concludes that the latter is a poor test to use on illiterates, and is of no advantage as compared with the briefer Scale A. Pennington (39) rejects the Serial Sevens Test (subtracting 7 from 100 serially) as invalid when the criterion is the Wechsler-Bellevue. The shortest of short forms proposed is the PTI (25) which is composed of four vocabulary items, two comprehension items, three similarity-difference items and three arithmetic items. The PTI is reported as correlating .74 with Wechsler-Bellevue.

### Deterioration

The general method of measuring deterioration as the difference between the intellectual level as measured by vocabulary and intellectual level as measured by other tests continues to be used and criticized. Acklesberg (1) points out that vocabulary appraisal by Capp's tests of synonyms, antonyms, categorization, word naming, and homographs shows differences between seriously and little deteriorated senile dementia cases. Rabin (46) reports that vocabulary scores rise from late "teens" to the seventies on the Babcock which may be one factor forcing increased deterioration with increasing age. Estes (12) suggests that a correction should be applied if a subject's verbal IQ deviates from the population average.

Wechsler's deterioration formula is criticized as failing to distinguish between mental deficiency and mental deterioration (5). Johnson (23) showed a correlation between the Deterioration Index (the ratio of tests that do not hold up with age to those that do) and chronological age of .60 for epileptics with IQ's of 80 and above; of .46 for epileptics below 80 IQ; and of .22 for nonepileptic feeble-minded.

Altus (3) reports a correlation of .88 between the Terman vocabulary test and the Army General Classification Test. He also notes high relation-



ship to the Wechsler Mental Ability Scale. Rabin (43) shows a correlation of .78 between the 1937 Terman vocabulary and Wechsler-Bellevue IQ's. The vocabulary gives higher mental ages than does the Bellevue.

The significance of the measures of deterioration was reviewed by Mayman (35) and studied by a short form Babcock (48) as distinguishing among various psychiatric classifications and normals.

### Factors Related to Test Scores

Wall (54, 55) used Ballard's Reading Comprehension test in England with a group of 330 British soldiers engaged in general laboring duties. He found that low reading scores, while related in part to low level of intelligence, were also related to factors of curtailed schooling, absenteeism from school, and changes in schools. Lorge (33) showed that individuals, equated for intelligence score at or near age fourteen, who complete successfully more years of school make higher intelligence test scores at or near age thirty-four. Broxson (8) indicates that adults with intensive remedial instruction can improve significantly on rate and comprehension. Muench (36) followed up eighteen mental defectives after 18 years. He found an average increase of three years and six months on mental age for eight boys who had the 1916 revision. The author believes that the stimulation of community life may account for increase in scores.

### Memory

Several new memory tests have been suggested. In one, (16) the scale is made up of counting up to a number and spelling with interference. Wechsler (58) presented a standardized memory scale involving personal and current information, orientation, mental control, logical memory, memory span, visual reproduction, and learning associations. He gives norms for 200 normals with age factors for each five year interval from age twenty to sixty-four years. Stone and his associates (51) suggest a shortened form of the Wechsler Memory Scale based on seven of his subtests. Using a ten-minute test for reproduction of fifteen visual designs, Graham and Kendall (19) suggest that the instrument, while invalid for detecting brain damage, may be useful as a memory test. Eysenck and Halstead (13) made a factorial analysis of fifteen memory tests and a test of intellect. They found that one general factor accounted for 74 percent of the score variance. The correlation of each memory test with the test of intelligence ranged from  $+.63$  to  $+.96$  implying that there was no need for postulating a memory factor.

### Studies of General Interest

Goldstein (18) shows that the abstract attitude is impaired with frontal lobe damage. He indicates, however, that the appraisal of such affect depends upon the nature of the task or test. Aldrich (2) using the Vigotsky test shows correlations ranging from .22 with the Object Assembly of the

Bellevue-Wechsler to .73 with the Picture Arrangement. Further, controlling measured intelligence, there was no difference between post-addicts and normals on the Vigotsky.

Sward (52) gave an elaborate mental test to forty-five university professors aged sixty to eighty years and to a comparable group age twenty-five to thirty-five. He finds that individual differences far outweigh age differences. Such differences as are revealed favor the younger men. The losses tend to be related to disuse and speed. Vocabulary, however, shows the older superior to the younger.

Eysenck (14) showed male *senile dementia* cases averaging at the eight year level of the individual Progressive Matrices. The errors, however, were of the kind that normal adults make.

Burton and Joël (9) present adult norms for the Watson-Glaser Test of Critical Thinking. Oakes (37) showed that the explanations of simple experiments were better when made by adults, but when lacking knowledge, the explanation was as naive as a child's.

It was shown (28) that workers under age twenty and over fifty do less well on job information tests than do those in the age range twenty to fifty years.

### Test Standardization

Gurvitz (22) criticizes the standardization of adult intelligence tests and suggests the utility of the 1940 U. S. Census for quota control on norms. The use of the method is illustrated for the "Kellogg-Morton Beta" (32) together with reports on the relation of the revised Beta to the Wechsler-Bellevue.

Pressey (40, 41) showed that altho *peak* performance is around twenty years of age, formal schooling is being prolonged progressively. He pleads for a shortening of formal schooling so that intellectually elite may utilize the more productive years of their lives.

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## CHAPTER IV

### Personality Development

ROBERT J. HAVIGHURST, RAYMOND G. KUHNEN, and CARSON McGUIRE

MUCH of the significant work on personality development in the recent period has been a result of combining concepts and methods of psychology and social anthropology. Sears (72) foreshadowed this approach in his review of three years ago. He pointed out that theories of learning and motivation had developed to the point where they could be applied usefully to the study of environmental conditions under which personality is, for the most part, learned. During the same year, Mowrer and Kluckhohn (55) contributed an admirable and provocative statement of a dynamic theory of personality.

Several investigations following the "personality and culture" approach have been reported recently. Three of five integrative studies of Indian personality undertaken jointly by the U. S. Office of Indian Affairs and the Committee on Human Development of the University of Chicago have been published. Thompson and Joseph (82) were responsible for the initial report on the Hopi; MacGregor (53) had the collaboration of Hassrick, and W. E. Henry in a study of the society and personality development of the Pine Ridge Sioux; Kluckhohn and Leighton (44, 50) brought together the research done among the Navaho, the second book being devoted to personality development as it is influenced by the way of life of "The People."

A research group at Columbia University has continued to develop the technic of psychodynamic analysis for the study of the relationships between personality and culture. In a book which describes the basic personality pattern for each culture, Kardiner (42) analyzed data supplied by Linton on the Comanche, by Dubois on the Alorese (22), and by "West" on "Plainville, U. S. A." (85). Benedict has made a rather similar analysis of Japanese character (12). These several studies of Indian and other simple and complex societies have a common emphasis on the importance of the early social experiences of the child in the formation of his personality.

Analogous studies of child development in the various social classes of the American society have shown how systematic personality differences arise between the American cultural sub-groups. Notable in this respect is the recent book by Davis and Havighurst (19).

A second significant area of personality research has been that of factor and syndrome analysis. Jenkins and Hewitt (39), by studying inter-correlations of various personality traits, came to the conclusion that there were three characteristic types of personality found among children in child guidance clinics. These types were described as the overinhibited

child; the unsocialized, aggressive child; and the socialized delinquent who is well adapted to his immediate group but gets in trouble with adults and with the wider world. Studying the backgrounds of these three categories of children, they found evidence that each type of child had been subjected to a peculiar kind of frustration. Moreover, the general pattern of behavior itself was exemplified by other persons with whom the child was in close contact.

Cattell (18) reviewed the research on personality description and measurement with special attention to the factors and syndromes which had been discovered. He found twelve "primary traits" or factors in personality which seemed to be clearly established by a variety of research. In a report on his studies of constitutional factors in personality, Sheldon (73) included the latest form of his "scale for temperament." From her clinical experience, Horney (37) delineated three types of neurotic conflict which she believed to be based on three different "solutions" of the young child's problem of "basic anxiety," or the reactions he experiences when he feels himself helpless and alone in a hostile world. She concluded that the child learns to meet this problem either by *going toward* people, *going away* from people, or *going against* people. Thus the child tends to become a *compliant* person, or a *self-sufficient* person, or an *aggressive* person.

A third area of personality research may be termed that of "ego-personality." This is quite different from the "personality and culture" approach already mentioned, tho not in conflict with it. Books and articles by Allport (1), Lecky (49), Cantor (15), and Axline and Rogers (6, 67), fall in this field. They all stress the importance of self-motivation or ego-involvement in human behavior. Cantor described a teaching process which leads to self-criticism, self-discipline, self-motivation, and responsibility on the part of the student. It should be noted that Rogers and his colleagues are evolving a theory of the self as an active, insightful, integrating process.

### **Technics for the Study of Personality Development**

Research workers in the field of personality development have amplified the nature and use of projective technics. Information obtained by their use may be related to the data on observed or overt behavior obtained in the interview and other technics of the field worker, in subjects' reports and personal documents, and thru psychometric and sociometric instruments. One should realize, tho that much of the usefulness of the projective technics depends upon the skill of the investigator and the adoption of a suitable frame of reference for organizing and interpreting the data meaningfully.

Sargent (71) has provided a useful survey of projective methods in personality research to 1945 with a bibliography of 274 titles. The bulk of the publication to date has dealt with the Rorschach method. Ford (26), working with children of superior intelligence and from the higher socioeconomic levels, has found the Rorschach test applicable, with slight modi-

fictions, to children as young as three years. One interesting finding was that boys tended to give movement responses earlier than girls and that girls tended to give color responses earlier than boys. As an outcome of four year's experimentation, Munroe (56) developed an inspection technic for selecting the well from the poorly adjusted in large groups thru the use of a 28-item checklist for evaluating the Rorschach responses.

The Thematic Apperception Technic (T.A.T.) has been employed increasingly in the study of personality and culture. In a significant expansion of its use, W. E. Henry (35) showed that the test, with pictures drawn to fit Indian cultures, could be used with American Indian children of several tribes. Not only did he make interpretations of individual personality structure but he made generalizations about the characteristic cultural pattern of each of the tribes.

From the clinical point of view, Balken and Vander Veer (9) presented examples illustrating the inter-personal dynamics of the test situation and discussed determinants related to several kinds of variable factors in the personality of neurotic children. Using a special set of pictures with high-school boys and girls, Symonds (81) categorized and counted the themes used by them in their stories, thus producing normative data against which to compare fantasy productions of individuals and groups.

The doll-play technic saw a considerable development. Bach (7) made a further report on his standardized doll-play technic for children aged three to five years in which fantasies could be experimentally induced and quantitatively studied. He found definite relationships between fantasy and behavior and concluded that the technic might be used for both research and therapeutic purposes. In matched-group experiments with children three to six years of age, Phillips (60) and Pintler (61) investigated the effects of varying factors in the projective doll-play situation. J. and Z. Henry (34) observed the doll play of Pilaga (South American) Indian children. They found sibling rivalry patterns closely resembling those in the cultures of the United States, except for the relatively small amount of remorse and self-punishing behavior shown by the Pilaga children. This was related to the absence of remorse and self-punishing behavior in the Pilaga culture.

Other projective technics reported were the sentence-completion method used by Rohde (68), Stein (71), and Rotter and Willerman (70); the Rosenzweig picture-frustration test (69); the World Test by Bolgar and Fisher (13); and the interpretation of children's drawings of animals by Bender and J. Rapaport (11). In an experiment involving fifty-five college women, Wachner (84) interpreted spontaneous drawings and paintings over a period of the time to obtain a picture of developmental changes as well as to confirm and supplement Rorschach findings about the personality pattern. A two-volume study by Alschuler and Hattwick (4) demonstrated that children's paintings parallel and express their emotional experiences and personality development.



A trend toward the use of intelligence tests to get evidence on personality and adjustment has continued. Much of the work has centered around the Wechsler-Bellevue test of adult intelligence. Escalona and D. Rapaport (24) summarized the work which has been done and described the uses which might be made of intelligence tests. They concluded that tests may be used to differentiate between the manifestations of congenital mental deficiency, of specific disabilities, and of various types of maladjustments. Anderson (5) pointed out that modern methods were being evaluated more critically in the light of the complexity of child behavior and development.

### **Processes in the Formation of Personality**

Research on processes in the formation of personality has been concentrated largely on the preschool child, on the assumption that the child's experience during this period has basic and continuing effects upon him. From a Freudian point of view, Ribble (66) analyzed the child's physiological and affectional experiences with the mother and related them to personality development. As an outcome of studies of the effect of the mother's emotional attitude on the infant, Dunbar (23) concluded that exhaustion thru overstimulation and the inhibition of growth thru overtraining are just as harmful as maternal overprotection. Baruch and Wilcox (10) found that child adjustment was related significantly to interparental tension and that girls were somewhat more affected than boys. Regarding jealousy as a normal response to actual, supposed, or threatened loss of affection based on the child's possessive love for the mother, Vollmer (83) discussed the variety of reactions thru which the engendered tension is discharged. Following up earlier experimental studies with intensive investigations of the life histories of fifteen adolescent institution children, Goldfarb (30) concluded that psychological deprivation in infancy results in a basic defect in total personality, manifested especially in inferior concept formation and a passive approach to the solution of emotional problems. In an analysis of some aspects of feeding behavior of seventy-two children, Baldwin (8) found that good appetite tended to appear in homes where the child received approval and conformed with "spontaneous happiness"; and that children with good table behavior tended to be found in homes with more severe discipline where the child conformed due to a pattern of fear and social isolation. Friedlander (27) studied the case histories of twenty-seven children who later became psychotic and found that extremes of discipline or overindulgence by parents were common. She established generalized patterns of early home life for those who later became schizophrenics and those who developed psychopathic personalities.

Gesell and his associates (29), without attempting to relate the child's behavior to the social environment, have continued studies of the first five years of life by presenting a developmental study of the patterning of

behavior to the tenth year. He presented a set of cross-sectional characterizations of the typical child from five thru ten years of age. Gesell's approach (28) is radically different from that of the researches described above. He is interested in developmental trends or laws which he believes to be present in the lives of all children. The other people are concerned with differences which arise in children due to variations in the social environment.

Stolz and Stolz (78) reported their study of the effects upon personality of different physical growth patterns during adolescence. They showed that some boys and girls become disturbed about rather typical physical developments and may suffer from emotional problems as a result, simply because the peer culture defines another pattern as more desirable.

### Development of Attitudes, Values, and Interests

Facets of personality are revealed in individual attitudes towards persons, things, and idea systems; in the kind and intensity of valuation or rejection of these outer realities; and in the nature of the positive affiliations as well as in the manner of identifying with or imitating them. Systematic explorations of these aspects of personality are to be found in the previously mentioned studies of simpler societies (42, 44, 50, 53, 82). In the Indian Research Projects significant information was obtained from the Emotional Response Test and the Moral Ideology Test which are described in the reports (50, 53).

Comprehensive studies of attitudes, values, and interests are rare in the case of research done in more complex societies. In a continuation of researches outlined in *Explorations in Personality*, Murray and Morgan (57) presented a detailed case study of the sentiments of eleven college men toward war, religion, parents, and sex.

The development of prejudices was the object of some investigation. Allport and Kramer (2) analyzed questionnaires given to 437 college students and summarized their findings in twenty-seven assertions. Two of these generalizations were that prejudiced people have unpleasant childhood memories of members of groups against whom they are prejudiced; and that prejudices tend to develop most frequently during the ages of six to sixteen. However, in an analysis of recent studies in the dynamics of prejudice, Lippitt and Radke (52) concluded that stereotypes are only later rationalizations of sentiments acquired earlier in life; that dislikes of other groups are taken over in childhood as part of the socialization process; that stereotypes are independent of and not affected by contrary personal experiences; and that reorientation of the prejudiced person involves studying the facts under guidance to the point where they are able to accept them and change their attitudes or it involves changes in the culture as a whole.

Havighurst, Robinson, and Dorr (32) studied the development of the ideal self in childhood and adolescence by categorizing "ego-ideals" in

an essay, "The Person I Would Like To Be Like," written by subjects in different age groups. With increase in age there appears to be a tendency to move from family figures to glamorous persons and attractive and visible young adults, thence to the composite imaginary person, there being some differences according to social status.

In a study of adolescents' food habits in relation to family training and present adjustment by means of questionnaires given to college students and to their mothers, Hellersberg (33) found that 72 percent of the subjects showed a close correspondence with patterns of mothers.

By analyzing activities preferred by boys and girls between ten and fourteen years of age, Hildreth (36) found supporting evidence for the observation that girls mature earlier than boys in social interests, these differences being related to their physiological sex maturation.

### Personality Change and Adjustment in Maturity and Old Age

This section of the review, the first on the particular topic to appear in the REVIEW OF EDUCATIONAL RESEARCH, covers studies published between 1944 and 1947. Previous research is summarized in the recent reviews by Kuhlen (45), Jones and Kaplan (40), Eysenck (25), and Kaplan (41). As these sources indicate, a substantial body of data has been accumulated regarding personality change during the adult years. Research of the type reviewed here provides a developmental perspective in which the life significance of adolescence or other phases may be better understood, and a basis for understanding the changes occurring in parents and teachers as they age—an understanding which is especially important since adults constitute highly significant aspects of the child's environment. Furthermore, the basic significance for adult education of data regarding the more mature learner is obvious; the relevancy of such data to more general educational problems is illustrated by Pressey's summary and interpretation of certain facts regarding adult years as they relate to educational acceleration and professional training (64, 65).

### Shortcomings of the Data on Adult Years

Research on maturity and old age must be cautiously interpreted. In general, the findings give more insight into differences between age groups within the *present* population than into the changes that present young people will experience as they grow older—tho, to be sure, the data are not devoid of meaning with respect to the latter trends. The facts must not be overlooked that *young people of today are maturing in a culture different from that which influenced the development of their elders* and will reach old age under a still different set of circumstances. The relative paucity of studies in this field may result in unsound generalizations being drawn from a single existing study, simply because contradictions among investigations using different population samples or different procedures have not yet had opportunity to appear.

### Cultural Factors in Aging

To no small extent the particular problems faced by individuals of any age and the general level of adjustment of older people is a function of the status they are accorded in society at large, a function of attitudes toward the aging process and toward the aged. Simmons (74, 75) has analyzed a number of primitive cultures with respect to the status of the aged, noting the vast differences among cultures in treatment accorded the old and the relationship of such treatment to their personality and adjustment. It is significant that the American culture is in certain important respects unfriendly to aging. Census data, discussed recently by Pollak (62) and by Lebergott (48), demonstrates the older individuals are more frequently unemployed. Casety (17) has recently cited evidence confirming previous data indicating a general aversion among employers against hiring older individuals—this despite the fact that ability of a substantial level remains well into old age and individual differences are, if anything, more pronounced. Dinkel (21) has shown that young people of high school and college age vary considerably in the extent to which they believe children should be economically responsible for the care of their aged parents. These data are interpreted as indicating that old people no longer have the security characteristic of a generation ago. Several writers (80) have proposed certain problems in this area needing investigation and have suggested methods by which they may be studied.

### Age Differences in Interests and Attitudes

Studies of interests provide information regarding the life activities of people and give insight into their motives, needs, and personalities. Data published prior to 1944 have indicated a trend toward increasing dislike for changing activities and toward sedentary, relatively solitary, and fewer interests and activities with increased age. Such trends in *inclination* to learn are of as great significance for adult educators as changes in *ability*, and the tendency to restrict interests may be a major factor contributing to general maladjustment in older groups.

Age differences in radio interests have been reported by Lazarsfeld and Field (47). Older groups show greater interest in religious programs, talks on public issues, news broadcasts, old familiar music, and a decreased interest in popular music, plays, and comedy programs. Link and Hope (51) made a general survey of adult reading, finding that altho the percentage reading books and going to the movies decreases with age, radio listening and newspaper reading hold up fairly well. The relative value of various media for reaching older adults is thus implied. Lassner (46) reported less frequent attendance at movies and plays, less of a tendency to identify self with the play, and more of a tendency to attend movies and plays for purposes of relaxation, as age increases. Patrick (59) investigated the carry-over of a variety of children's activities to adult life by correlating present activities of twenty to thirty-year-old adults with their recalled

participation before thirteen. As one would expect, correlations were low. Alexander (3) has studied aversions, reporting briefly that older people show no tendency toward having more antipathies; actually, those over thirty had fewer antipathies than those under thirty but the difference was not reliable.

From time to time various public opinion polls report age differences in attitudes. Each issue of the *Public Opinion Quarterly* (79) summarizes the "quarter's polls." In general, specific attitudes reported there reveal a more "old-fashioned" point of view among older age groups, greater conservatism and less readiness to approve new ideas and changes. Cantril (16) reports that age is one of the factors making for extremes in attitudes. A synthesis and interpretation of public opinion and market poll data (much of which is unpublished) would represent an important contribution to present knowledge of age differences in representative samples of the population.

### Personality and Adjustment

No comprehensive studies of age trends in personality have appeared during the period of this review, tho certain exploratory investigations or subsidiary findings have been reported. Guilford (31) reported older people to be less carefree, but this was the only subtest of his personality schedule to show a significant age change. Klopfer (43) administered the Rorschach to fifty old people, ages sixty-two to ninety-three. Their responses indicated a somewhat lowered intellectual efficiency, restricted thought content, constriction with respect to reactions both to inner promptings and to emotional stimuli from the outer environment. Sward (80) tested an older and a younger group of college professors with intelligence tests and reported that the older group (sixty to seventy-nine years) made many more self-belittling comments indicative of strong feelings of inferiority and self-depreciation than did the younger group (twenty-one to forty-two years of age). There is occasional reference (e.g., 58) in the wartime psychiatric literature to the factor of age in the neuroses, the older group being slightly more susceptible to the stresses of military life and combat. Pollak (63) has examined the social maladjustment of older men as reflected in crime records, noting a characteristic pattern of delinquency among the old and the relatively high frequency of certain crimes, particularly sex offenses. Brookover (14) studied the adjustments of veterans to civilian life. The older groups more often wished to return to their old jobs and were less desirous of educational or vocational information or training. Taken together, these miscellaneous studies imply that older individuals meet problems different from those of the young, are more serious and less confident in dealing with them, and react to frustration in characteristic ways.

Relatively little has yet been done either to plan programs for promoting the better adjustment of the old or to evaluate the effectiveness of such programs as are in operation. The work of Martin (54), who described the



technics used in the San Francisco Old Age Counseling Center, and of De Gruchy (20), who published informal case reports illustrating the application and effectiveness of these technics, thus have special significance.

### The Future of Research on Aging

The prospect for research in the field of aging is encouraging. Recent growth of interest is indicated by (among other developments) the establishment of two journals dealing with aging (*Geriatrics; Journal of Gerontology*) within the past two years. A comprehensive research planning report on Social Adjustment in Old Age (76) has been prepared by a subcommittee of the Social Science Research Council, and certain agencies are interesting themselves in the financial support of such research (38). Possibly the most immediately helpful research will be concerned with methodological problems relating to technics for studying individuals of widely varying ages, with personality changes revealed by longitudinal studies, with a more thorough analysis of cultural attitudes toward aging, and with the investigation of changing values, motives, and adjustment problems with increased age.

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## CHAPTER V

### Social Development

CARSON MCGUIRE and ROBERT J. HAVIGHURST

THE preceding chapter deals with the more individual aspects of personality. This chapter deals with social adjustment and the influence of social groups in the formation of personality.

#### Social Adjustment

Social adjustment involves two complementary processes, orientation and socialization. *Orientation* is the process thru which an individual finds channels for expressing his inner motivations in a system of social relationships. Every individual has to dovetail his behavior into a society, or some social group within a society. His problem is to learn skills and technics, rules and sanctions, symbols and value-attitudes, which permit him to maintain his place as a social being in the society and, at the same time, give him a sense of personal identity. *Socialization* is the process of presenting alternative channels for individual behavior together with positive and negative sanctions which will lead to the acceptance of some and the rejection of others. It emphasizes the influence of social groups, formal and informal, upon the personality of the individual. As a resultant of the socialization process, the individual learns a culture. (Each social group teaches certain common and standardized ways of doing things, of behaving and of believing, characteristic of its culture.) When inner motivations are incompatible with culturally acceptable expressive channels, and when the individual is forced to comply without compensating satisfactions, neurotic compensatory satisfactions are sought.

Since complex societies have a number of different kinds of social groupings, each with its sub-culture, social adjustment varies from segment to segment of the society. Depending upon the way in which different investigators identify these segments, and upon their various preferences in explaining behavior in terms of orientation to or socialization by social groups, there are several distinct research approaches to the study of differential social adjustment.

Some approaches are concerned with groupings on the basis of age, sex, and physical strength factors, and their relation to social adjustment. Bonney (7) found some sex differences in social success and personality traits in three groups of fourth-grade children. Pupil choices, teacher ratings, and self-ratings (obtained by analyzing responses to the California Test of Personality) consistently favored the girls. Jones (22) selected the ten strongest and the ten weakest boys in a normal urban school population of seventy-eight seventeen-year-old boys by tests of physical ability. The strong boys were found to be superior in social



prestige, personal adjustment, and freedom from anxiety, but they revealed a poorer school adjustment in comparison with the weaker boys. The latter showed a tendency toward poor health, social difficulties, feelings of inferiority, and personal maladjustment on the revised and extended form of the Rogers Test of Personality used in the study.

Other research workers prefer to identify deviants within a society and study their social adjustment. Barker, Wright, and Gonick (5) have reviewed the literature on eighteen types of physical deviations in relation to the problem of personal adjustment to physical handicap. Gates (14), compared eighteen matched pairs of crippled and noncrippled boys and girls. He concluded that cultural backgrounds and personal-social relationships, particularly in the family, may affect personal-social adjustment more than crippledness. In a study of 373 high-school girls, Silverman (37) administered the P.E.A. Interest Inventory 8.2b to groups of girls rated highest and lowest in appearance by their teachers. The group rated as being significantly poor in appearance were more negativistic, more withdrawn, more self-effacing and less interested in people and social activities than the group rated highest in appearance. Two other areas of deviancy were represented by Harris' appraisal of delinquency in adolescent girls in wartime (17), and Smith's study of pupils dropping out of a mid-western high school (38).

### **Social Development in Simpler Societies**

In her review of research on primitive children, Mead (29) not only discussed the systematic differences between fully-aculturated members of different living cultures but emphasized the importance of research on children of primitive societies as a means of constructing and refining theories of personal and social development. In a later article Mead (30) suggests research in simpler societies with the cultural pattern as one factor in the development of total personality and the innate maturation pattern of the Gesell-Ilg approach as another.

From the data on simpler societies, Kardiner (23) abstracted a series of fourteen key integrational systems. These were found to operate in different ways, in the several societies studied, to socialize the individual member and to establish a hierarchy of "systems of basic personality structure" characteristic of the particular culture to which the individual must orient himself. To Kardiner, character variations are different modes of achieving socially defined goals. As societies grow more complex, the person whose character formation permits him to be self-assertive can achieve the most highly approved goals. This brings in the concept of social mobility in relation to character formation and the status-class-prestige complex. Whether or not Kardiner's psychodynamic analysis is entirely valid, his approach is most provocative and suggestive of further research projects.

With regard to the Indian Research Project, it is evident that a number

of factors operate to produce different kinds of social development in the several societies. In the Hopi individual, as depicted by Thompson and Joseph (40), there is a strong feeling of support from a cohesive group. This requires conscious conformity to the group pattern along with rigid suppression of any strong impulse. Kluckhohn and Leighton (25, 27) examined the processes thru which Navaho society provides group support with an extensive periphery for individual freedom. For "The People," witchcraft has been a means of defining and personalizing an individual's anxiety in a way that will give him imaginative release. Moreover, he is accepted by others who will help him thru the curing rites. The Sioux society, as presented by MacGregor (28), is a picture of disorganization. The positive directing influence of the white schools during childhood and adolescence find few counterparts in adult roles and codes. The society generates a feeling of ineffectiveness and helplessness in a world which, for the most part, is looked upon as hostile and dangerous.

Kluckhohn (24) outlined preliminary results of a longitudinal study of forty-eight Navaho children from a single community, the study being in its eleventh year. Tentative comparisons were made between the social development and personality manifestations of these children and those of two other Navaho communities, one being more acculturated and the other less acculturated in relation to white society. Comparisons were made also with typical children from the Hopi and Sioux tribes. Goldfrank (15) examined the relation of child-rearing practices to adult personality patterns in two Pueblo Indian societies, the Hopi and the Zuni. Despite early leniency, which would presumably predispose them toward secure and easy-going types of behavior, the older children exhibited fearfulness and sadness in projective tests in excess of middlewestern children. It was concluded that severe disciplines imposed after the period of infancy by external agents—impersonators of the supernatural and members of the priesthoods—are personality determinants as important, if not more so, than the training of infancy.

In a comparative study, Tulchin and Levy (40) administered the Rorschach test to twenty-two matched pairs of Spanish and English refugee children from ten to fourteen years of age. The Spanish children were found to be more compliant and anxious, intellectually less abstract, emotionally more responsive and outgoing; the English, more reserved, introspective, less patient, revealing more verbalization, and less demonstration of affection.

### **The Effects of the Family, Peer Group, School, and Other Social Structures**

The individual, from childhood to adulthood, has interrelated and interdependent memberships in a family of orientation, a peer group, a school, probably a church, and possibly in several kinds of adult-organized and adult-controlled social and economic activities. West's social anthropo-

logical study of *Plainville, U. S. A.* (43) clearly demonstrated the socializing influence of these structures in a semi-rural society.

Frankl's report of preliminary results of the study of children and mothers in a well-baby clinic (12) pointed up crucial situations in the social-emotional development of the infant and child. Lafore's monograph (26) related dictating and interfering behavior by the parent to hostility in the child; blaming and punishing to crying; and ignoring and diverting to teasing and nagging. By means of his standardized doll-play technic, Bach (4) studied twenty pairs of father-separated and father-home children, six to ten years of age. He found that the father-separated children produced an "idealistic and feminine fantasy picture" of the father when compared with the control children, who elaborated the father's aggressive tendencies. In a similar investigation of 126 boys and girls, father-separated and father-present, aged three to five years, R. Sears, Pintler, and M. Sears (36) studied the specific problem of fantasy aggression. Among the conclusions they reached, two might be cited. Boys from father-absent homes portrayed much less fantasy aggression than boys from father-present homes. Girls from father-absent homes portrayed slightly more aggression than girls from father-present homes.

The place of the children's culture in social development is still largely unexplored by research. Tryon's article on the adolescent peer culture (41) discussed the changes in behavior of boys and girls thru pubescence and adolescence, the differentiation of the social-sex roles in the peer group, and the relationships of the subadult society to the dominant adult social structures. Much definitive work remains to be done, especially in delineating the goals, the roles, the intra-group and the extra-group tensions, the codes and the technics of enforcing codes in the peer culture.

In a study of the social and emotional adjustment of regularly promoted and nonpromoted pupils, Sandin (35) compared 139 pupils who had failed of promotion at least once in grades one to eight with 277 fellow students. Employing a number of technics—interviews, observation, sociometric and rating scales, evidence was built up in regard to the negative effects of nonpromotion on social development. However, the investigator did not refer to the special cases, the effects of nonpromotion on the physically under-developed and the socially immature individuals. In a consideration of the problem of school discipline, Hacker and Geleerd (16) claimed that adolescents with emotional disturbances can be handled with better results and with a more favorable prognosis when treated with firm authority, rather than with an atmosphere of unlimited freedom without restrictions.

### **Social Class Differences**

In his article on socialization and adolescent personality, Davis (9) delineated the three broad systems of social rank which circumscribe

development and behavior in our complex society—the social class, the ethnic group, and the color class systems. Davis and Havighurst (10) analyzed the data from guided interviews with 50 mothers of young children in each of four groups, white middle-class, white lower-class, Negro middle-class, and Negro lower-class. They found that the social class differences in child-rearing practices were greater than the differences between Negroes and whites of the same social class. Middle-class families, white or Negro, were more rigorous in training for feeding and cleanliness habits and began such training earlier. They also found some color differences. Negroes were more permissive than the whites in the feeding and weaning of their children. However, they were much more rigorous than the whites in toilet training. Davis and Havighurst concluded, on the basis of their sample, that there are *cultural differences* in the personality formation of middle-class compared with lower-class people, *regardless of color*, related to their early training. Moreover, they suggested, there are less marked but identifiable cultural differences between Negroes and whites of the same social class. Part of this study, dealing with the differences between middle-class and lower-class white families, had been reported earlier by Ericson (11).

Havighurst and Janke (19, 21) studied the relationships between various abilities and social status among ten-year-olds and sixteen-year-olds in a typical midwestern community. Their reports show that children from families of high social status did consistently better on several tests of intelligence and mental ability than children from lower status families. However, on the Minnesota Mechanical Assembly Test there was no social class difference for sixteen-year-old boys altho a significant difference appeared in the case of ten-year-old boys.

In a sociometric study of the aforementioned sixteen-year-old and ten-year-old groups, Neugarten (33) found that both the friendship status and the reputation of these midwestern school children paralleled the social class position of their families. Children of higher status families were more popular and had better social reputations. Age changes in these factors were related to changes in the constitution of the groups and to the decrease in adult control.

Even in less complex semi-rural communities, these social class differences would seem to appear. In his previously mentioned book, West (43) found an unexpected discrimination system which assigned rank and provided patterns of expected behavior for every individual and group in the community.

Warner and Srole (42) reported upon the eight ethnic subsystems of Yankee City. The forces that operate to maintain a variant cultural tradition as well as the processes by which succeeding generations distribute themselves thru the social class levels of the community were examined in detail. Case material has been utilized to portray the "social personality" of the individual, especially in the process of social mobility.

### Group Relationships

Group relationships, as such, have been studied in a number of contexts using various methodological approaches. Morgan (32) investigated the social relationships of 274 children in a war-boom community, grades four to eight, 60 "oldtimers" and 214 "newcomers." He used a sociometric technic to measure social participation, and a "Guess Who" test to study social reputation. He found that a child's reputation and status were based partly upon his actual behavior and partly upon the picture people carried in their minds about the social group to which he belonged. Length of residence in the community was not significant nor was place of residence, except that children living in trailers were accorded an unfavorable position. Cook (8) also reported on a sociometric study, finding consistent relationships between social class background and friendship choices.

Sociality, the impulse to be social, was investigated by Hartley (18) using a sample of 140 boys, ten to twelve years of age. Three tests, Pictorial Extensity, Measure of Special Friendships, Measure of Acquaintance Volume, appeared to discriminate between groups of boys judged to be very social and very unsocial in relation to their peers. Hartley concluded that a certain amount of aggression, flexibility, sensitivity to the situation, dominance, and tolerance of others are involved in successful social relationships. In another monograph, Newman (34) demonstrated the use of "composite" and "integral" behavior rating scales, as well as anecdotal and conference records, in the study of adolescents in social groups.

In studies of teacher's classroom personalities, H. H. Anderson and his co-workers (2, 3) investigated the effects of teachers' dominative and socially integrative contacts on children's behavior. It would appear that "integrative" teacher behavior encouraged "integrative" pupil behavior; that "dominative" teacher behavior not only provoked conflicts and misunderstandings but stifled "spontaneity" and social development of the children. Moreover, a change in the classroom group did not change significantly the pattern of individual behavior. On the other hand, a change in teachers did result in a change in pupil behavior.

Group therapy has been the central procedure in a number of studies. Gabriel (13), working under the supervision of Slavson, presented the results of group therapy experiences with six girls from fifteen to seventeen years of age. From the group interplay, Gabriel concluded, the girls gained insight by seeing themselves in others, in a not too threatening way. In a large day camp, Hewitt and Gildea (20) made provisions for four unadjusted girls, aged seven to nine years, to meet in a group with another child of high social adjustment. As a result of the group interaction, personal needs became apparent. Later, the children became much better adjusted to the large group. Baruch (6) reported a project in group therapy with 23 college students. At the end of the sessions, twenty-three of the twenty-five members indicated positive outcomes. Moreno (31) described the functions of the stage, the subject, the director, the staff of



auxiliary egos, and the audience in the psychodrama as a method of group psychotherapy.

### The Role of the Teacher in Social Development

The report of Prescott and his co-workers on the staff of the division on child development and teacher personnel (1) focused on helping teachers understand children. The book told how teachers of one school system gained new insights into the nature of child growth and behavior. They utilized facts and understandings gathered thru observation of children and making anecdotal records. Additional facts and understandings about the structure and dynamics of classroom groups were gleaned by the use of sociometric technics and group observation.

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## CHAPTER VI

### Motor Development

ANNA ESPENSCHADE

**T**HE past three years have produced nothing of importance in the investigation of motor development in infancy or early childhood. Much has been added to knowledge of adolescent changes in motor performances, however. The war provided impetus for experimentation in the measurement of physical fitness of high school and young adult age groups. Emphasis in this area has been placed upon changes brought about by training. The availability for experimentation of large numbers of men in the twenty-one to forty age group has thrown light on motor changes in these years, also.

#### Age Changes and Sex Differences in Adolescence

Growth in fine motor abilities in adolescent boys and girls has been reported by Jones and Seashore (31). In some functions, as reaction time, growth has apparently reached its limit by fifteen years while in others as serial discrimination, the gain at fifteen is as great as in previous years. For the battery as a whole, girls are slightly retarded as compared with boys. Sardon (47) tested Peruvian children on manual coordinations and found a regular increase in capacity with age. He found girls to be inferior to boys in manual celerity.

The development of gross motor coordination in boys and girls as measured by the Brace Test was studied by Espenschade (19). Six hundred and ten children were tested and the results were compared with those obtained in the California Adolescent Study. The increment pattern for boys of total scores on the test battery is similar to that of adolescent growth in standing height. Scores for girls show little change after the thirteenth year. All tests for boys in which dynamic balance is a factor show a marked "adolescent lag." Sex differences are small before the age of 13.8. After that time, boys excel in all events and their superiority increases at each age level. Differences are most marked in agility.

Strength of right and left grip show almost identical growth curves in boys from eleven to seventeen and a half years. Jones (28) shows that boys at age twelve reach about 50 percent of the manual strength they are to have at seventeen and a half. Growth in strength of pull and thrust proceed at almost identical rates, also, but not until the age of thirteen and a half does the boy show 50 percent of the strength he will at seventeen and a half in these measures. For girls at twelve years of age, both grip and pull strength are at approximately 70 percent of the seventeen and a half level; push or thrust strength matures still more rapidly, and is at approximately 80 percent of maturity at twelve years. Performances

of boys in running, jumping, and throwing are relatively more mature than strength. At thirteen and a half years, these measures are from 75 to 85 percent of the seventeen and a half level. Mean scores for grip strength of boys and girls in the California Adolescent Study are included in *Development in Adolescence* (27), a report of one individual with the group as background.

The influence of physiological age on the physical strength of boys was studied by Crampton early in the twentieth century. In order to make this work readily available, it has been reprinted in *Child Development* (9). The relation of physiological maturity in boys to physical activity has been noted by Espenshade (20). Jokl (32) studied the relation of menarche to performance in strength, speed, and endurance events by forty white South African school girls. He found the postmenarcheal group tended to surpass in strength, the premenarcheal in endurance. In static dynamometric strength, Jones (30) found postmenarcheal girls were stronger than premenarcheal girls of the same chronological age. The premenarcheal growth spurt in strength begins about one year before menarche and reaches a peak close to the time of menarche. Late maturing girls lag behind the average at all ages.

#### **Measurement of Motor Ability**

A cutting-out test for measuring motor control in children eight to thirteen years of age has been developed by Mandeville (40). Scores on this test showed no relation to IQ, sex, or age but depend mainly on manual skill. Brozek (6) has proposed a new group test of speed of hand and arm movements. Tuchman (51, 52) has examined the reliability of the Minnesota rate of manipulation test with various subjects, and individual testing as compared with group testing. The measure is highly reliable altho the group situation produces better scores.

The Oseretzky scale for measuring genetic levels of motor proficiency has been adapted for Portuguese children by Leita da Costa (38). An English translation from the Portuguese has been published recently (39). Alabastro (1) used this scale to test 260 Italian children and reports that a study of profiles gives important data on development and age differences of motor capacities examined.

Fisher et al (22, 24) standardized measurement in railwalking and with the ataxiograph on young adults. Reliabilities for the railwalking test ranged from .67 to .85; on the ataxiograph from .77 to .92. There was no correlation between tests.

Travis (50) studied dynamic and static equilibrium by means of a stabilometer and an ataxiograph. Results from the two measures are unrelated. Visual cues were found to aid greatly in the performance in both tests. Weight is significantly related to dynamic equilibrium in both men and women. A small sex difference in favor of women was found. Travis (49) also investigated the relationship between balance and recovery from rotation. A correlation of .52 was found.



A procedure by which both strength and endurance can be measured on the hand dynamometer has been developed by Fisher and Birren (23). The test is highly reliable and has some degree of validity. Some improvement with practice occurs. The strength of college women can be measured by performance tests such as the push-up and pull-up with relatively high validity, according to Wilson (56). Studies in the methodology of chinning, sit-up, leg lift, and other measures of muscular strength and endurance have been reported by Cureton et al (12), DeWitt (17), Kappovich et al (34), and Wedemeyer (54). The study of Cureton et al deserves special mention as twenty-eight exercises were analyzed kinesiologically and evaluated statistically.

A valid and reliable test of motor fitness for high-school girls has been published by O'Connor and Cureton (43). The test measures balance, flexibility, agility, strength, power, and endurance. Bookwalter (4) found sufficient relationship between height and weight and performance of high-school girls to indicate that a classification scheme for activity would be of value. Such a scheme is proposed. Tests as the Brace, Johnson, Seashore Series A rhythm, and the like can be used to measure the capacity of college women to learn dance technics, according to Benton (3). The stunt-type test has been shown to be susceptible to practice (21), but results on practiced tests are equally valid. A thoro study of tests to measure the sports ability of high-school girls has been published by Anderson and McCloy (2).

A short screen test for predicting motor fitness of college men has been developed by Cureton, Welser, and Huffmen (11). It consists of seven items which can be given in thirty minutes to a large group. Phillips (45) has proposed a JCR (jump, chin, run) test for the assessment of ability of men in fundamental skills. Scoring tables are included.

### **Influence of Training**

Junior high-school boys were tested by Daughtrey (13) in speed, strength, accuracy, and coordination events at the beginning and at the end of a school term. One half of the group were given no specific instruction whereas the others were carefully taught. Neither group improved in shot-put or broad jump. Eighty percent of the trained group improved in all other events while only 56 percent of the control group improved.

Adolescent boys in the first nine months at the Physical Training Battalion in Pretoria grew in bulk, on the average, at a rate five times as great as they would have in their unsatisfactory home environment, according to Craven and Jokl (10). The amount of improvement to be expected of high-school girls in one year on the battery of tests recommended by the U. S. Office of Education has been computed from 4500 records (53). The average improvement represents roughly an increase equal to about one half of one standard deviation on the original scales.

Several investigators have studied changes in performances of college women. Smalley and Smalley (48) report improvement in strength significant at the .01 level of confidence in an eight-week period. Mohr (41) obtained significant improvement in several tests but none in the push-up or step test. Petrosky (44) found gains in abdominal and arm strength but not in running or jumping. A greater percentage of those with low scores at the beginning showed more improvement than did those whose first scores were medium or high. Women who obtain low scores in fundamental sports skills upon entrance to college improve more in special classes than in regular sports classes, according to Salit (46). Davies (14) reports that a complex motor skill is acquired more rapidly by college women and reaches a higher level when regular and expert instruction is given.

Cureton et al (12) tested both high-school boys and college men at the beginning of the term, after one week, after twelve weeks, and after the thirteenth week. Improvement in the first week is attributed to initial adjustment in the twelve weeks to training and in the last week to final motivation. Over-all improvement in endurance exercises averaged 10.4 percent.

A number of reports of training programs for the armed forces have been made. Clarke (8) found that air-crew students after a three-month training period scored well above the average college student on the Rogers Strength Index. Only 25 percent failed to reach the college norm. Wieman (55) traced the improvement which took place in 78,260 ASTP students in speed, strength, and endurance in twelve weeks. He noted that older men improved more slowly. Karpovich and Weiss (33) tested 4172 men aged eighteen to forty who were in the Army less than one month, then retested after three months' training. Greatest deficiencies upon entrance were in arm strength. Marked improvement occurred in speed and in endurance as well as in strength. Larson (37) reported the construction of fitness tests for the Army Air Force and the results obtained from this program. Measures of strength, speed, coordination, and endurance were included. Standards were established which were reached by 23 percent at the beginning of training and by 92 percent at the end. A progressive and uniform retrogression in fitness with increase in chronological age was found in every component. The reports of Dawson (15, 16) regarding the influence of aging on power and endurance in man should be noted in this connection, also.

### **Relation of Motor Abilities to Other Factors**

Kopp (35) gave the Oseretzky test to fifty stuttering children and found that according to Oseretzky's categories, 20 percent of the stutterers showed some motor deficiency, 26 percent severe deficiency, and that 40 percent were classed as motor idiots. This test has not been standardized for American children.

The railwalking test was used by Heath (25, 26) to select extreme motor

deviates in the Army. He has analyzed the mental pattern found in such individuals. This same test was used by Myklebust (42) to study motor performance of deaf children. The subjects, aged five to twenty-one, showed progression with maturation. There were marked sex differences with the males decidedly superior. Individuals whose deafness was due to meningitis were markedly inferior in motor performance.

Brozek et al (7) examined motor performances of young men who were given a partially restricted and later an acutely deficient diet in vitamin B complex. No decline in performance was noted under partial deficiency but deterioration significant at the 5 percent level was found during acute deficiency in gross bodily reaction time, pattern tracing, and ball-pipe. No differences in tapping or speed of finger movements were found.

The learning of fundamental motor skills by children in an average school was compared with that of children in a school for mentally retarded children (36). The subjects were fifth and sixth-grade children. Groups superior in intelligence learned about twice as much as subnormals in the more difficult tests. Girls were superior to boys in learning.

Boys high in physical strength tend to have good physique, to be physically fit, and to enjoy a favored social status in adolescence, according to Jones (29). Boys who are low in strength show a tendency toward an asthenic physique, poor health, social difficulties and lack of status, feelings of inferiority, and personal maladjustment in other areas.

Negro and white tenth-grade girls do not score significantly different in the Brace Test battery (18) altho differences in favor of the whites are found in two subtests of balance with the eyes shut and of leg strength, flexibility, and control.

### **Nature of Motor Abilities**

A factor analysis of mechanical abilities by Wittenborn (57) yielded six factors, three mental and three motor. The motor factors were identified as stereotyped movement, manual dexterity, and steadiness. Further investigation (58) of so-called manual dexterity tests showed that they were made up of size (maturity), strength, spatial visualization, and true manual dexterity, which is dependent largely upon tactual and kinesthetic modalities and independent of vision.

Cureton (12) identified four primary factors in tests of muscular endurance: lateral muscles, limb locomotor muscles, arm extensor muscles, and running endurance.

In a study of motor learning, Brace (5) distinguished two types: "sport-type" learning which relates to performances involving the use of speed, strength, power, and dexterity in manipulating the body in control of some object, and another type which involves gross bodily motor activities not related to an external object nor requiring marked use of strength, speed, or power.

These studies tend to confirm earlier studies which have found motor abilities to be relatively specific in nature.

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## CHAPTER VII

### Physiological Factors in Development

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**T**HE present review deals primarily with studies appearing since the publication in the December 1944 *Review* of the summary by Shock (44). Certain topics covered in the previous reviews have not advanced significantly and are, therefore, omitted. Areas of greatest research activity in this general field include the following: (a) the effect of prenatal conditions, such as maternal disease and diet, on fetal and neonatal development; (b) the developmental effects of anoxia at birth; (c) the effects of diet on growth and development; (d) the effects of diseases on development; (e) the physiological aspects of adolescent development.

#### Prenatal Development

*Maternal Influences:* The disease rubella (or German Measles), often regarded as a mild disease of childhood, has recently been shown to have potential importance in the etiology of congenital defects (19). Investigators (3, 17, 36, 52) have found that among infants with congenital defects such as cataracts, deafness, and anomalies in the structure of the heart, a large proportion have been born to mothers suffering from rubella during the first and second months of pregnancy. On the other hand, many mothers suffering from rubella during the early months of pregnancy have given birth to normal infants (16). Altho the association of maternal rubella and congenital defects is apparently greater than chance, other factors are involved.

*Maternal Agglutinins:* The subtle influences of the maternal organism on fetal development (other than the placental transfer of nourishment and removal of wastes) are well illustrated by recent studies on the Rh isoagglutinins of the blood. Here gross pathology in the child has been shown to result from certain incompatibilities in the blood composition of the mother and the developing fetus (38). This general concept has been expanded in observations of Yannet and Lieberman (60), who reported a high incidence of such blood group incompatibilities among 119 low-grade mental defectives. The authors believe the cerebral abnormality of nineteen of the cases could be related to maternal Rh isoimmunization during pregnancy.

*Maternal Blood Chemistry:* Sontag (48) has reported instances of impaired postnatal development in children born to mothers who were emotionally disturbed during the pregnancy. He believes that the developing fetus was adversely influenced by the physiological disturbances of the mother. While this concept is an attractive one, in accord with the physio-

<sup>1</sup>The assistance of Miss Charlotte Fox in the preparation of the bibliography is gratefully acknowledged.

logical facts of placental transmission, the extent to which changes in blood chemistry may alter subsequent mental development is not yet known. These observations on maternal-fetal relationships offer a potentially fruitful field for further investigation.

**Maternal Diet:** Observations on the effect of maternal diet on the offspring have been greatly expanded during the past three years. The studies carried out at the Harvard School of Public Health have been effectively summarized by Stuart (51). Without question weight, body length, vitality, and rate of ossification may be influenced by the amount of protein in the maternal diet. Even tho the babies born to mothers living on poorer diets are smaller, the incidence of difficult birth, toxemias of pregnancy, and other maternal diseases is significantly greater than in mothers receiving adequate or good diets. On the basis of these studies (7, 8, 43) it has been recommended that the caloric intake during pregnancy be increased from the normal values of 2200 to 2400 calories to 2600 to 2800 calories and that the protein intake be increased from the normal adult value of sixty grams per day to eighty-five or even 100 grams per day. It is also recommended that the intake of calcium, phosphorus, and iron as well as vitamins A, B (thiamine, riboflavin, niacin), C (ascorbic acid), and D be substantially increased during pregnancy. It has also been shown that the incidence of vitamin deficiencies in the mother are greater among pregnant women than among normals.

In states of near starvation, such as that prevalent in western Holland in May 1945, a significant reduction in fetal weight and length was observed (47). With the restoration of the maternal food supply, the birth weights returned to prewar levels. A slight but statistically insignificant increase in malformations of the fetus was also reported. It is important to realize that this study is based upon conditions of generalized under-nutrition, during a relatively brief period of time. The effects of prolonged selective malnutrition, such as that observed by Stuart and others, may produce more marked effects on both mother and fetus.

In animal experiments where severe vitamin deficiencies in the mother can be experimentally produced, it has been shown that certain fetal anomalies of development occur. Riboflavin deficiency in the mother inhibited the formation of the skeleton in the fetus (53, 54). Maternal Vitamin A deficiency resulted in congenital defects of the eye of the newborn (55, 57, 58). It is not known whether the results of these acute experiments in animals can be applied to humans or not.

While not all of the above-mentioned relationships between the fetal and maternal organisms can be regarded as definitely established, there are sufficient indications that this area should be further investigated.

### **Birth Asphyxia and Birth Injuries**

Altho reports of the importance of asphyxia at birth in retarding subsequent mental development continue to appear (9, 39), the crucial experiment comparing intelligence test scores on siblings, one of which was

anoxic at birth and the other normal, has yet to be done. Preston (39) has attempted to distinguish between two groups of children, one of whom was hyperactive as a result of a lesser degree of anoxia and the other apathetic as a result of a greater degree of anoxia. In a study of 132 such children subjected to varying degrees of anoxia at birth, ninety-seven were found of average or higher intelligence; twenty-three were dull or borderline; and thirty-five were subnormal. The investigator thus believes that a differential effect on physical, mental, nervous, and emotional as well as personality development may appear in children who experienced post-partum anoxia. The earlier such anomalies of development were recognized, the more hopeful was the prognosis for avoiding behavior problems in the children. Significant improvements in the relationship of children and parents were observed when the parent was shown that the disability of the child was a physical one. Furthermore, the emotional and personality development of such children could be improved thru training.

In animal experiments where relatively severe degree of neonatal asphyxia can be produced, it has been shown that such asphyxia is followed by impaired learning ability (59).

### **Dietary and Nutritional Influences on Mental Development**

*General Nutritional Level:* A number of investigators have studied the effect of dietary improvement on school performance. MacKenzie (29) reported a rough positive relationship between nutritional status and scholastic attainment, when both variables were classified into three broad categories. A somewhat more convincing study is that of Kugelmass, Poull, and Samuel (27), who determined the effect of nutritional improvement on test intelligence in 182 children between the ages of two and nine years. Half of the patients were institutionalized, whereas the other half were outpatient cases. The group of children, which was malnourished at the time of the first mental test and well nourished at the time of the second test, showed a rise of ten IQ points for the retarded group and a rise of eighteen points for the mentally normal, in contrast with an average zero change for the group well nourished at the time of the first test and still well nourished at the time of the second test. There was a correlation of  $-.56$  between the age at the time of the first test and the IQ rise. The investigators interpret this negative correlation as evidence of a greater chance of improvement in mental function, the younger the malnourished child is when nutritional therapy is instituted. They regard the relative constancy in the IQ change in children above the age of four years as evidence for the irreversibility in mental development following prolonged malnutrition. Other studies have indicated similar trends (37).

Altho certain writers are convinced that neurotic, psychopathic, or even criminal tendencies may be associated with low-blood sugar levels in children (25, 26), quantitative data on blood sugar levels are conspicuous by their absence.

*Vitamin Supplements:* Attempts to improve growth and mental development by the administration of vitamin concentrates have usually met with little success. Mangold (30) was unable to demonstrate any significant improvement in height, weight, school attendance, or performance on school examinations in children who were given two milligrams of thiamine a day over a three-month period.

Positive results from thiamine administration have been reported, however, in a carefully controlled study by Harrell (22). In this study children were carefully matched with respect to height, weight, age, sex, educational achievement, length of residence in the orphanage, and intelligence test scores. Altho the orphanage was located in Virginia, the selection of experimental groups and the total number of tablets, whether thiamine or placebo, were sent in sealed envelopes from New York. Thus, the experimenters in the orphanage had no knowledge of which treatment the children were receiving. A total of fifty-five pairs ( $N=110$ ) children were tested. The experimental groups received two milligrams of thiamine per day over a one-year period. At the end of this time significant differences between the experimental and control group were observed in visual acuity, reading, memorizing of new material, code substitution, and educational achievement. At the end of the first year twenty pairs of children were reversed; i.e., the child who had been receiving thiamine in the first year was placed in the placebo group during the second year. At the end of the second year tests were given the children again. It was found that in most instances the child who had been receiving thiamine in the first year of the experiment, but a placebo in the second, was now surpassed by his matched companion who had been treated with thiamine during the second year. This is the most carefully controlled experiment that has appeared in this field. It gives strong support to the conclusion that mental performance can be influenced by thiamine intake. It is also evident that long periods of administration of the vitamin may be necessary for demonstrating positive results.

*Amino Acids and Mental Development:* The importance of amino acids on growth and development has long been recognized. The essential amino acids are obtained by chemical breakdown of protein ingested in the diet. The animal resynthesizes the amino acids absorbed from the gut into new proteins within the animal. A recent study has indicated the potential importance of one of these amino acids, namely glutamic acid, in mental development. Striking improvement in eight children between the ages of sixteen months and seventeen and a half years by Zimmerman and his coworkers (72, 73). The administration of six to twenty-four grams per day over a period of six months was followed by increments of as much as four years in mental age within the six-month treatment period. The average increase in Binet IQ's was eight points in the eight children tested. Children who were of subnormal intelligence at the first test showed the greatest increments in mental ages. It has also been reported that the retest records



showed more dynamic responses, suggesting a change in the basic personality structure of the individual as well as improvement in mental performance. Physiological mechanisms whereby the improvement in mental performance takes place have not been elucidated. However, biochemical studies have shown that glutamic acid is the only amino acid known to be metabolized *in vitro* by slices of brain tissue (56). It has also been shown that glutamic acid reactivates one of the important enzyme systems which is concerned with the transmission of the neural impulse (33). Zimmerman and Ross (63) were able to speed the learning of a maze by white rats treated with glutamic acid. Similar experiments have been reported by Albert and Warden (2). This is suggestive evidence that more experiments are required in order to definitely establish the relationship between glutamic acid feeding and mental performance.

### **The Effects of Diseases on Development**

During the course of infectious diseases, physical growth in children is often impaired. However, permanent retardation in growth or development has not been demonstrated. No relationship was found between frequency of illness and final body size (21) or personality development in adolescents (20), nor could it be said that children who showed exceptionally low growth rates were absent from school due to illness more frequently than normally growing children (31). No evidence of permanent detrimental effects on school success due to illnesses such as asthma, bronchitis, chicken pox, etc., could be found among 200 pupils (9). Normal growth may be attained even in the face of such diseases as tuberculosis (40, 49). Disease processes do not themselves seem to be determinative in personality development; but the social and psychological reactions of others, particularly adults, to the disease and the treatment accorded the sick child, particularly during convalescence, may have extreme importance in the genesis of personality and behavior disorders (6, 15). Opposed to this conclusion are the studies of Lurie and Levy (28) who believe that neurologic sequelae of whooping cough in young children may be a factor in the development of a social or abnormal behavior in later life, and of Richter (41) who believes that a temporary syndrome of anxiety and depression with compulsive, obsessive, phobic thinking and behavior may develop as a result of mild upper-respiratory infections in children. Studies of crippled and physically handicapped children emphasize the importance of the social environment rather than physiological characteristics of the handicapped in influencing mental and personality development (5, 32).

Personality and psychological changes have been reported following certain diseases in which a secondary involvement of the central nervous system may occur. Examples of such diseases are pneumonia (4, 34), malaria (42), and pernicious anemia (1, 13) as well as the usual encephalitic diseases (20, 40). Psychological reactions in patients suffering from

poliomyelitis have been reported (11, 50). In general, the patients reacted with depression and anxiety when they realized the nature of their disease. Patients with bulbar signs tended to have greater psychologic disturbances than those with only spinal paralysis. These reactions were amenable to psychiatric treatment as indicated by Rorschach records taken before and after therapy (11).

Fisher and Dolger (14) reported the results of their follow-up study from forty-three diabetic patients who had suffered from the disease from early childhood. With the severe limitations imposed upon the child by his disease, certain behavior problems seem to be more prevalent among the diabetic children than among normals. The investigator believes that the type of behavior problem which was apt to appear was determined chiefly by the attitude of the parent. Parents who are over-solicitous seem to generate a submissive, dependent, apathetic type of problem, while parents who show resentment and rejection of the child because of his disease seem to generate rebellious, belligerent behavior on the part of the child. Here again it is important to note the importance of the social environment in the development of behavior abnormalities.

Eisele (12) has examined the subsequent development of seventy-three cases of diabetes in patients who had the disease for twenty years or more. In all cases the disease was first discovered in early childhood or youth. Children who developed diabetes before the discovery of insulin (1922) had small chance of survival. However, with adequate control of the disease by the proper use of insulin, the survival rate of diabetic children approaches that of normal children. Emotional maladjustment was significantly greater in the diabetics than in normals. The educational achievement of the diabetics was high (42 percent attended college compared with 7 percent of the general population). This may be the result of economic selection, since the patients studied probably came from high economic groups.

### Adolescent Development

Jones (23) has shown that in boys static dynamometric strength is relatively independent of gross body size, but a combination of size and body build provide a fairly adequate representation of the factors determining strength. Strength correlated .52 with weight, .33 with height, and .34 with mesomorphy as determined by the Sheldon rating technic. In girls, growth in strength was correlated positively with sexual maturity (24).

The physiological responses to severe exercise were measured in the same group of 100 children as they progressed thru adolescence and attained maturity (44, 45). After measurements of pulse rate, blood pressure, and oxygen intake were made under basal conditions, each child climbed five flights of stairs as rapidly as possible and then lay down on a cot. Continuous measurements of pulse rate, respiration rate and volume, oxygen intake, and carbon dioxide elimination were made over a forty-five.

minute recovery period. Systolic and diastolic blood pressure measurements were made at one to one and a half minute intervals. From the data collected, recovery curves were plotted for each variable for each experiment. Analyses of these observations indicate that altho the work output increased as children matured, the rate of recovery with respect to physiological factors such as pulse rate, blood pressure, and oxygen consumption diminishes with increasing age over the adolescent span.

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## CHAPTER VIII

### Physical Growth from Birth to Maturity

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**R**ESearch on physical growth has been varied during the interval since the last review, but three major trends deserve mention.

First, in exploring developmental aspects of growth there has been a continued emphasis upon longitudinal investigations of the same children thru time. This plan of research makes possible studies of individual variation in rate of development, and for a given sample size yields smaller standard errors for growth increment means than does the cross-sectional approach. Sample shrinkage, a major practical problem in longitudinal research, has been dealt with by workers at the Brush Foundation (63) by adding cases as needed and analyzing the data in terms of overlapping age groups arranged so as to permit "splicing" together the results for different stages of development.

Second, there has been an emphasis upon the investigation of patterns of morphological variation among individuals, and of the relationships between physique, temperament, disease, and physical capacity. Interesting in this connection is the application of factor analysis to sets of anthropometric intercorrelations in an attempt to define mathematically the dimensions of growth and physical differentiation.

Third, there has been an emphasis upon the integration of research findings from various sources. The last three years have perhaps produced fewer reports than heretofore on major investigations, but have been noteworthy for several comprehensive reviews including both published and unpublished findings on special topics (e.g., 15, 35, 37, 67, 73). These contributions have colligated and evaluated an extensive and scattered literature which the nonspecialist finds it difficult to correlate, owing to innumerable variations from study to study in sampling procedures and statistical treatments. However, these reviews suggest that much research effort would have been more productive had samples been more adequately selected and defined, and had anthropometric technics been applied in a more standardized fashion.

#### Factors Conditioning Growth

*Geographic and racial influences:* Cluver and co-workers (12) compared the stature and weight of white school children in America, Canada, England, and South Africa. The relative superiority in stature of the South Africans and inferiority of the English was attributed to climatic factors. Meredith (41) presented body size comparisons for African Bantu children and American children of three racial stocks. Michelson (42, 45) supplied data on the American Negro which suggest that differences in nutrition

and general health are more significant than are racial differences per se in accounting for differences in physical growth between white and colored groups. In a careful study, Lasker (31) compared immigrant and American-born Chinese of the same stock. He discovered that the American-born were superior in stature, weight, and length of extremities, but had more shallow chests and relatively narrower hips. Andrews (1) reported similar findings for two closely related groups living in different regions of Siam. Both investigators concluded that a broad pattern of change in physical proportions may be induced by environmental factors, especially diet.

*Socio-economic and temporal factors:* Hopkins (26) reported that growth differences, correlated with socio-economic status, had persisted among Ottawa school children despite the improvement in the financial situation of worker families owing to the war. Laporte (30) offered evidence that Parisian school children who suffered war-imposed dietary limitations over a period of five years were lighter and shorter than a comparable prewar group. Meredith and Meredith (40) compared the data on stature obtained in mass surveys of the Toronto school population in 1892 and 1939. The more recent population was markedly taller. Maximum differences were observed for puberal age groups, suggesting a trend toward earlier maturation as well as greater stature.

*Illness and endocrine disorder:* Jackson and Kelly (27) investigated the relationship between growth rate in diabetic children and level of control of the disease. Erratic growth reflected fluctuating levels of the disease, but children under adequate control tended to exhibit normal growth. Dunham and Thoms (18) did a follow-up study on the effects of severe rickets in early childhood. All cases in this small sample had some deformation of the lower extremities at adolescence. The half who had rachitic pelvic deformations were older at the time the rachitic process was active than were those who escaped. Bayer (3) and Fancher (22) reported on children with endocrine-caused disorders of growth and discussed their methods of treatment.

*Hereditary factors:* Bruce and Scott (7) described similarities and differences among a set of quadruplets with respect to height and weight gains and hand ossification. Onset and rate of ossification of twenty-six centers in identical triplets were studied by Sontag and Reynolds (64), who concluded that the genetic pattern of ossification may be modified by environmental factors or acquired metabolic characteristics. Reynolds (51) compared the pattern of ossification among twins, siblings, cousins, and arbitrarily paired children from unrelated families. The closer the degree of kinship, the more similar was the pattern of ossification.

*Prenatal conditions:* Sontag, Reynolds, and Torbet (66) related basal metabolism determinations on pregnant women to the size of their children at birth. Mothers who had moderately high BMR's produced longer, heavier babies advanced in skeletal maturity. This suggests the inadvisability of administering thyroid to reduce the birth size of the child.

*Pubescence:* Ellis (21) confirmed previous observations that boys who mature early are heavier and taller between the ages of nine and fourteen years than are those who mature late. Stuart (67) supplied a nontechnical account of the general features of physical growth and development at adolescence. The reader is referred to this article for a summary and review of earlier studies in the field.

### **Growth—Stature and Weight**

Simmons (63) published a comprehensive monograph on the physical growth data secured by the Brush Foundation Study on Child Growth and Development. The sample consisted of a thousand Ohio children, from white families above average in education and economic status. Cross-sectional age-sex norms for some twenty-five anthropometric dimensions and for skeletal maturity were presented together with stature-weight-skeletal age intercorrelations from three months to seventeen years. Special problems were the relationship between physical growth and IQ (correlations offered no basis for prediction) and the relationship between age, height, skeletal development and terminal stature. Bayley (4) determined the percentage of mature height achieved by children of various degrees of skeletal maturity, and published tables for predicting within rather narrow limits of error the ultimate stature of normal children from their skeletal age and height at the time of the X-ray.

### **Growth of Body Segments and Tissues**

*Head:* Meredith (37) reviewed findings on the relationship between head circumference and age, sex, lineage, diet, birth molding, birth order, etc. Wallis (73) synthesized results from various sources, some unpublished, on sex differences in relation to cephalic index. Boyd (6) offered a formula relating head circumference and body length for clinical use in evaluating the normality of cephalic size and growth.

*Pelvis:* Reynolds (53, 55) used serial roentgenograms in a careful investigation of the growth of the pelvis from early infancy to nine years. Curves for boys and girls ran parallel courses, but boys seemed to lead in size of outer dimensions and girls in inner pelvic structures. Greulich and Thoms (25) also used serial X-rays to investigate changes in the female pelvis associated with puberty. Time relationships with other puberal changes were noted. Meredith and Carl (39) reported on growth trends in hip width. Palmer (48) measured accurately the center of gravity of the body and showed that it moved down to the upper pelvic region during the growth period.

*Extremities:* Findings from Davenport's extensive researches on the growth of the extremities were published posthumously (15). They included longitudinal and cross-sectional data on many groups, including comparisons between races, and between normals and dwarfs. The article contains a discussion of errors in research of this type. Meredith colligated published and unpublished findings on arm growth (38) and foot length

(35). He pointed out the need for standardized anthropometric procedures and the gaps in our information concerning nonwhites and children of low socio-economic status.

*Skeletal ossification:* Elgenmark (20) demonstrated great variation in individual ossification patterns of children between the ages of one and sixty months. He reported that one cannot draw definite conclusions regarding other centers on the basis of differentiation present in a few isolated areas. Leonard (32) gave normal age ranges for the appearance of centers in the wrist. Michelson (46) proposed a method of skeletal assessment based on the progressive maturation of the individual bone, in contrast to Todd's evaluation of the maturation of the total hand and wrist area.

*Dentition:* Sandler (58) found few significant relationships between age at eruption of deciduous teeth and sex or weight of child or nativity of mother. Meredith (36) supplied an extensive review on the order and age of eruption of deciduous teeth.

*Body tissues:* Reynolds described a roentgenometric procedure for determining absolute and relative breadth of fat, muscle, and bone tissue in the leg, and described growth changes in proportions of these tissues during childhood (52) and adolescence (54). Stuart (69) described growth trends in childhood by age and sex in the thickness of skin and subcutaneous tissue.

### Appraisal of Physical Status and Growth

Sontag and Reynolds (65, 56) described the use of the Fels Composite Sheet in evaluating growth progress, and offered illustrations of deviant individual patterns as related to illness, etc. The chart is arranged so that the development of a child in various dimensions may be recorded graphically in comparable standard score units, based on norms supplied by the authors. Wetzel (74) adapted his grid technic to the evaluation of the direction and speed of physical development in infants. Massler (33) offered a formula for calculating normal weight, based on the product of specific gravity and body volume, the latter arrived at by an approximation procedure. The method is appropriate only for the "normally proportioned body." No evidence as to its value was supplied. Craig (14) compared results from five different methods for estimating the appropriate weight of college women. Marked disagreements in classification of subjects as overweight or underweight were found. The Pryor method classified 56 percent of all subjects as underweight and was considered not applicable to this Wellesley group. Stuart and Meredith (68) evaluated various appraisal procedures in a nontechnical article on the use of body measurements in the school health program. They regarded weight, stature, pelvic breadth, chest circumference, calf circumference, and subcutaneous tissue thickness as constituting the most useful indicators of physical status and growth progress, and described standard technics for measuring them.

They emphasized the inappropriateness of evaluating contemporary school children by reference to norms obtained prior to 1930, owing to the secular trend toward greater size which has been repeatedly demonstrated.

### Physique and Morphological Variation

*Body build and body proportion:* Draper, Dupertuis, and Caughey (17) published a volume based on their extensive researches on the relationship between human constitutional variation and specific diatheses. Draper recognized three main body types—slender, average, and heavy, and described the disease tendencies of each. Attention was also given to androgyny, i.e., the mosaic of male and female characteristics blended in each physique. Emphasis was placed on treating the patient as a psycho-organic whole and on evaluating him in terms of his "individual normal." Seltzer (60) reported that body disproportions (deviations of anthropometric indices beyond arbitrary limits) in normal young men were associated with autonomic instability, greater sensitivity and complexity of personality, and less adequate social adjustments. Seltzer and Gallagher (62) reported a distribution of somatotypes among white private school boys aged thirteen to seventeen similar to that reported earlier for college groups by Sheldon. Bullen and Hardy (8) applied Sheldon's somatotyping procedure to body build photographs of college women. They concluded that dysplasia was more common among women and that the range and distribution of somatotypes was somewhat different for men and for women. Since their sample included only women, one cannot exclude the possibility that women assigned to a given somatotype may show a somewhat different patterning of basic components from men of the same somatotype.

*Sexual differentiation in physique:* Seltzer, Seltzer, and Brouha rated male physiques as to the strength of the "masculine component," and related this variable to personality assessments made by psychiatrists (59) and to an index of physical fitness (61). Bayley and Bayer (5), making a similar assumption that sexual differentiation can be rated relatively independent of other characteristics of physique, provided an assessment scale and supplied standards for estimating androgyny in members of either sex. This method is unusual in taking account not only of relative maleness and femaleness, but also of the intensity of sexual differentiation from asexual to bisexual. Their data indicated considerable reliability for the rating procedure. Development of sex differences in pubic hair distribution was described in detail by Dupertuis, Atkinson, and Elftman (19).

*Theoretical and mathematical contributions:* Winthrop (76) made a theoretical analysis of the premises underlying various kinds of biotypologies. Burt (9, 10) and Thurstone (70, 71) applied their factorial technics to the mathematical determination of the number and kind of dimensions required to account for a matrix of anthropometric intercorrelations.



Unfortunately, their solutions are not independent of the analytic methods used. Thurstone's solutions tended to reveal factors for growth in different body areas, e.g., head size, length of extremities, etc., while Burt's produced a general size factor and bipolar factors for body width vs. body length.

### Contributions to the Theory and Technics of Research

Medawar (34) developed a method for expressing mathematically changes in the shape of the human body from embryo to adult by a continuous set of transformations in which time is the parameter. This method of analysis makes it possible to compute the rate of change in body shape as a function of position and age. Baker (2) proposed a procedure for graduating human growth curves without breaking them up into short time intervals. Jense (28) in a nontechnical paper discussed general considerations in statistical methodology, emphasizing the need for control of all relevant factors in studying growth. Tildesley (72) concluded that the choice of a unit of measurement in anthropometry depends not on the accuracy to which a character can be measured, but on the fineness of grouping necessary in order to obtain from the data as reliable an estimate of variability as sample size permits. She supplied data on the variability of seventy characteristics of the body, to assist the researcher in choosing an appropriate unit of measurement. Wilmer and Scammon (75) reviewed the various procedures which may be used in presenting visually the topographic features of the human body. They emphasized the utility and flexibility of iconometry, ("that branch of graphics that represents two or more bodies or structures . . . by means of figures drawn to some common scale"); for comparisons of the same individual at different stages or for comparisons of different individuals.

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